2.0 INVESTIGATION ACTIVITIES, OBSERVATIONS, AND RESULTS

To fulfill the objectives and purposes of this SI, the following field activities were conducted.

- Site preparation activities were performed, such as clearing vegetation, locating underground utilities, obtaining water from a nearby fire hydrant, and dewatering the concrete sump.

- Soil samples were collected to characterize soil conditions in the drainage ditch, dry well area, cleanout pipe, transformer pad, fuel oil tank vault, and landfill using a Geoprobe® direct-push sampling technique or hand tools.

- Five exploratory trenches were excavated and sampled to characterize landfill material and native material beneath the landfill.

- Drums of solidified concrete uncovered in the landfill were staged for later disposal, and concrete chip samples were collected for characterization of the concrete.

- Soil samples were collected from buckets containing Umatilla Army Depot Borrow Site material.

- Sediment at the base of the concrete sump was sampled.

- Five microwells were installed and sampled to characterize groundwater in the drainage ditch, dry well area, and area west of the former laboratory.

- Six existing monitoring wells were sampled during two events to characterize groundwater throughout the site.

- Two product samples were collected from small containers found on the surface of the landfill.

- The horizontal location coordinates and vertical elevations of all sampling locations were obtained by licensed surveyors.

- Landfill debris, investigative-derived waste, and buckets containing Umatilla Army Depot Borrow Site material were disposed of by a licensed disposal contractor.

All samples collected during this SI were analyzed by STL Seattle (formerly Sound Analytical Services, Inc.) of Tacoma, Washington. The samples of Umatilla Army Depot Borrow Site material also were analyzed by Southwest Research Institute, in San Antonio, Texas, for chemical warfare agents and their breakdown products.

This section discusses sampling locations and techniques, field observations and results, analytical results, and deviations from the management plan (URS 2001). Sampling locations are depicted on Figure 2-1. Sampling locations and methods are summarized in Table 2-1. The analytical program is presented in Table 2-2. Field notes, including daily logs and reports, boring and trench logs, and data sheets, are in Appendix A. Analytical results summary tables and laboratory data reports are in Appendix B.

The field portion of this SI was conducted as described in the management plan (URS 2001), except as described in Section 2.9. Field activities were implemented from September 4 through 15, 2001; January 8, 2002; February 12 and 13, 2002; and April 10 and 11, 2003.

All drilling, excavating, and sampling equipment used during this investigation was decontaminated between use at individual borings, trenches, or other sampling locations. Decontamination procedures are discussed in Section 2.6. Upon completion of field work, a licensed survey contractor surveyed all sampling locations (Section 2.7). All waste generated from investigation activities was temporarily stored onsite prior to disposal, as discussed in Section 2.8.

2.1 SOIL INVESTIGATIONS AND CONCRETE SAMPLING

The top of the landfill and the areas around specific sampling locations were cleared of vegetation either by hand or using an excavator. Underground utilities were marked by their respective utility companies, followed by a utility locate service that was contracted to locate and verify underground utilities onsite.

Soil samples were collected to characterize soil conditions at 33 locations (Table 2-1) in the background areas, drainage ditch, dry well area, cleanout pipe, transformer pad, fuel oil tank vault, and landfill. At 19 of these locations, borings were advanced using a Geoprobe® technique. A Geoprobe® is a hydraulically powered, percussion probing machine. At the remaining 14 locations, samples were collected from the ground surface or excavator bucket using hand tools. Samples also were collected using hand tools from 5-gallon buckets containing Umatilla Army Depot Borrow Site material soil that was stored at the site. Concrete chips were collected from drums of solidified concrete uncovered in the landfill. Each sample was numbered with the last two digits of each soil sample name representing the final depth of the

sample. For example, sample SS-001-01 was collected from location SS-001 from a depth of 0 to 1 foot bgs.

Apart from the exceptions noted below, soil and concrete samples were analyzed using EPA SW-846 methods for the following EPA Contract Laboratory Program (CLP) target compounds and analytes: VOCs, SVOCs, pesticides, PCBs, metals (plus strontium and uranium), and cyanide (Table 2-2). Specific landfill trench samples (Section 2.1.8) also were analyzed for diesel-range and heavy-oil-range petroleum hydrocarbons using method NWTPH-Dx. Soil samples collected at the transformer pad (Section 2.1.6) were analyzed for PCBs only. Soil samples collected from the fuel oil tank vault (Section 2.1.7) were analyzed for VOCs, SVOCs, and petroleum hydrocarbons. The Umatilla Army Depot Borrow Site material samples (Section 2.1.9) were analyzed for SVOCs, pesticides, PCB hydrocarbon mixtures, metals, explosives, and chemical agent breakdown products. Concentrations of detected compounds in soil samples are presented in Tables 2-3 through 2-6. Boring logs and other field notes are presented in Appendix A. All analytical results are summarized in tables in Appendix B.

2.1.1 Geoprobe® and Soil Sampling Techniques

Nineteen borings were advanced using a truck-mounted, direct-push, Geoprobe® rig. Probing tools were pushed into the ground using the weight of the rig combined with percussion to advance the tool string. This technique was used to collect soil samples and install temporary microwells for groundwater sampling. At soil sampling locations that were inaccessible to the Geoprobe® rig, shallow samples were collected using hand tools.

The push probes, constructed of 36-inch by 2-inch steel, were lined with polyethylene tubing to prevent cross-contamination. Continuous soil samples were collected for geologic description, in some cases, to determine when native material was encountered. All geologic descriptions and boring logs were completed in accordance with American Society for Testing and Materials (ASTM) Practice D2487 and D2488 (ASTM 2000a, 2000b) under supervision of a geologist licensed in Oregon state. In addition to standard geologic classification, any abnormal staining, odors, or unusual features were noted on the boring log form. Boring logs were not completed for locations where samples were not collected, or were collected using hand tools.

Each sample was screened for the presence of VOCs using a photoionization detector (PID) immediately after the sample was removed from the probe. Prior to logging, soil samples were collected for chemical analysis. To minimize volatilization, soil for analysis of VOCs was collected and preserved in the field using EPA SW-846 Method 5035. (The detailed procedures for collecting and preserving soil samples for low-level and high-level VOC analysis using this method are presented in the management plan [URS 2001]). After VOC samples were collected, soil was transferred to a decontaminated, large, stainless steel bowl. The sample material was

then thoroughly homogenized by stirring with a decontaminated stainless steel spoon prior to placing the material into sample containers.

At the conclusion of each boring, if a microwell was not installed (Section 2.3), the boring was abandoned in accordance with the Oregon State Department of Water Resources monitoring well standards (Oregon Administrative Rules [OAR] Chapter 690 Division 220). Grouting material consisted of hydrated bentonite pellets. The grouting material was manually placed into the hole as the push probes were removed.

2.1.2 Background Locations

Five soil samples (SS-001-01, SS-001-12, SS-002-01, SS-032-01, and SS-032-14) were collected from three background locations where past site activities were not likely to have impacted the soil.

Samples SS-001-01 and SS-001-12 were collected from a location in the southeast portion of the site near an underground utility vault at depths of 0 to 1 foot bgs and 11 to 12 feet bgs, respectively. Sample SS-002-01 was collected from the surface (0 to 1 foot bgs) at the end of an east-west trending drainage ditch extension in the landfill. Samples SS-032-01 and SS-032-14 were located in the southwest portion of the site and were collected from depths of 0 to 1 foot bgs and 13 to 14 feet bgs, respectively. A Geoprobe® was used to collect all of the background samples. No evidence of contamination, such as odor, abnormal staining, or PID readings, was detected in these samples.

Four VOCs, six SVOCs, one pesticide, and 21 metals were detected in the background soil samples. For the remainder of this report, background concentrations are used only for metals in soil; otherwise, background values were assumed to be zero for the organic constituents. The metals values are considered representative of background concentrations and were used for comparisons of site concentrations relative to background concentrations in a human health risk evaluation (Section 4.4). Available background values for metals in soil for the Clark County, Washington, region (Washington State Department of Ecology [Ecology] 1994), and facility background values for the adjacent RMC site (CH2M HILL 1996b) also were used for comparison to investigation results.

2.1.3 Drainage Ditch

Eleven soil samples were collected from six locations (SS-003 through SS-008) in the drainage ditch. Sample SS-005-01 was collected using hand tools, and the remaining drainage ditch samples were collected using a Geoprobe®. No evidence of contamination, such as odor, abnormal staining, or PID readings, was detected in these samples. Mottling or natural staining was evident in many of the soil samples.

Nine VOCs, 17 SVOCs, one pesticide, one PCB, and 24 metals were detected in the 11 soil samples collected from the drainage ditch, as follows.

- **Freeze-Thaw Drain (SS-003-01 and SS-003-05).** Six VOCs, 14 SVOCs, and Aroclor® 1254 were detected in the shallow sample. In the deeper sample, one VOC was detected. No SVOCs or PCB hydrocarbon mixtures were detected in the deeper sample. Cyanide was not detected in these samples. Twenty-one metals for which these samples were analyzed were detected.

- **Sump Drain and Former Removal Area (SS-004-03 and SS-004-09).** One VOC and one SVOC were detected in the shallow sample. Two VOCs and one SVOC were detected in the deeper sample. One pesticide was detected in the deeper sample but not in the shallow sample. No PCB hydrocarbon mixtures or cyanide was detected in these two samples. Twenty-one metals for which these samples were analyzed were detected.

- **East of Landfill (SS-005-01).** Eight VOCs, 12 SVOCs, one pesticide, and 24 metals were detected in this sample. No PCB hydrocarbon mixtures or cyanide was detected.

- **Former Hazardous Materials Storage Building (SS-006-01 and SS-006-05).** Four VOCs and eight SVOCs were detected in the shallow sample, but neither were detected in the deeper sample. No pesticides, PCB hydrocarbon mixtures, or cyanide was detected in these samples. Twenty-one metals for which these samples were analyzed were detected.

- **Former Oil Storage Building (SS-007-01 and SS-007-05).** One VOC was detected in the deeper sample but not in the shallow sample, and one SVOC was detected in both samples. No pesticides, PCB hydrocarbon mixtures, or cyanide was detected in these samples. Twenty metals for which these samples were analyzed were detected.

- **Corner of Northwest Graham Road (SS-008-01 and SS-008-05).** One VOC and one SVOC were detected in the shallow sample. No VOCs or SVOCs were detected in the deeper sample. No pesticides, PCB hydrocarbon mixtures, or cyanide was detected in these samples. Twenty-one metals for which these samples were analyzed were detected.

2.1.4 Dry Well

Twelve soil samples and two duplicate samples were collected at various depths from the following seven locations in the dry well area using a Geoprobe®: sampling locations SS-009 through SS-012, SS-030, and SS-031 (surrounding the former dry well soil removal area) and sample location SS-013 (located within the former excavation).

Sample SS-013-10 was collected from the native material beneath the former excavation, and sample SS-013-12 was collected from directly above the water table. The shallow samples surrounding the former excavation (SS-009-08, SS-010-08 [SS-310-08 duplicate], SS-011-08, and SS-012-08) were collected in native material surrounding the former dry well at depths of 7 to 8 feet bgs. This depth was chosen because it represented the depth to which contamination originating at the dry well might have migrated. The deeper samples nearest the former excavation (SS-009-11, SS-010-12, SS-011-11, SS-012-11 [SS-312-11 duplicate], and SS-013-12) were collected from directly above the water table, which was located at approximately 11 to 12 feet bgs.

At location SS-012-11, a strong solvent odor similar to paint thinner was noted and a maximum PID reading of 58.7 ppm was detected; no abnormal staining was evident. No evidence of contamination, such as odor, abnormal staining, or PID readings, was detected in the remaining samples. Based on field observations at SS-012, two additional samples were collected (SS-030-10 and SS-031-10) at a depth of 10 feet bgs above the water table. Locations SS-030 and SS-031 were approximately 10 feet north and 10 feet northwest of SS-012, respectively. No evidence of contamination, such as odor, abnormal staining, or PID readings, was detected in these two samples.

One VOC (2-butanone) was detected in dry well area soil samples SS-010-08 (SS-310-08 duplicate), SS-012-08, SS-012-11 (SS-312-11 duplicate), and SS-013-10. Two more VOCs were detected in sample SS-012-08, and four VOCs were detected in the sample from the center of the former dry well (SS-013-12). No VOCs were detected in the remaining dry well area soil samples. One SVOC was detected in each of samples SS-009-08, SS-010-12, and SS-013-12. No SVOCs were detected in the remaining dry well soil samples. Twenty-one metals for which the dry well area soil samples were analyzed were detected in one or more of the samples. No pesticides, PCB hydrocarbon mixtures, or cyanide was detected in the dry well area soil samples.

2.1.5 Building Cleanout Pipe

Soil samples were collected from beneath the cleanout pipe at three locations (SS-014, SS-015, and SS-016) using a Geoprobe®. Sample SS-014-04 was collected at a depth of 3 to 4 feet bgs, and samples SS-015-05 and SS-016-05 were collected at a depth of 4 to 5 feet bgs. No evidence

of contamination, such as odor, abnormal staining, or PID readings, was detected in these samples.

Four VOCs were detected in one building cleanout pipe soil sample (SS-014-04). One VOC and four SVOCs were detected in sample SS-016-05. Nineteen metals for which these samples were analyzed were detected. No pesticides, PCB hydrocarbon mixtures, or cyanide was detected in the three building cleanout pipe samples.

2.1.6 Transformer Pad

Surface soil samples were collected using hand tools at four locations (SS-017 through SS-020) in the vicinity of the transformer pad. Samples SS-017-01, SS-018-01, and SS-019-01 (SS-319-01 duplicate) were located south of the transformer pad outside the fence; sample SS-020-01 was located north of the transformer pad inside the fence. No evidence of contamination, such as odor, abnormal staining, or PID readings, was detected in these samples. Aroclor® 1254 was detected in all samples.

2.1.7 Fuel Oil Tank Vault

One soil sample (SS-021-04 [SS-321-04 duplicate]) was collected in native material directly beneath the former 10,000-gallon tank location at a depth of 3 to 4 feet bgs using the Geoprobe®. The boring was advanced through fill material to the base of the vault to 8 feet bgs. Groundwater was not encountered. The sample was collected in the southern portion of the former excavation, near where the former fill port presumably was located. The sample was limited to an area of darkened soil. No additional evidence of contamination, such as odor or PID readings, was detected at this sampling location. The sample contained asphalt and concrete fragments that likely were remnants from tank removal activities.

Three VOCs, 16 SVOCs, and diesel-range and heavy-oil-range petroleum hydrocarbons were detected in the fuel oil tank vault sample and duplicate. These detections may be misrepresentative of actual soil concentrations due to the asphalt fragments present in the sample material.

2.1.8 Landfill Sampling and Drum Removal

Soil samples were collected in the landfill from the north toe area and exploratory trenches (Figure 2-1). A sample of concrete was collected from drums removed from the landfill. Drums from the landfill were staged in a designated area within the landfill fence for later disposal (Section 2.8). Table 2-7 summarizes the type and disposition of landfill contents encountered during this investigation.

North Toe

Surface soil samples (0 to 1 foot bgs) were collected using hand tools at four locations (SS-022 through SS-025) along the north toe of the landfill. Samples SS-022-01, SS-023-01 (SS-323-01 duplicate), SS-024-01, and SS-025-01 are located east to west along the north side of the landfill. No evidence of contamination, such as odor or abnormal staining, was detected in these samples.

Nine VOCs, 19 SVOCs, and 23 metals were detected in one or more samples. Three pesticides and Aroclor® 1254 were detected in sample SS-024-01. No pesticides or PCB hydrocarbon mixtures were detected in the remaining three soil samples collected from the north toe of the landfill. Cyanide was not detected in these landfill soil samples.

Exploratory Trenches

Five exploratory trenches (TR-1 through TR-5) were excavated and sampled in the landfill (Figure 2-1). Excavation of exploratory trenches was completed using an excavator operated by Anderson Environmental Contracting of Longview, Washington. Observations and profiles of the trenches were recorded on trench logs (Appendix A). The excavator bucket in direct contact with the sampled materials was decontaminated using a hot-water pressure washer prior to use in each trench. Soil samples representative of landfill material and native material were collected from the center of the excavator bucket.

Trenches TR-1 through TR-4 were excavated to collect representative samples of the landfill and underlying native material and to observe landfill contents. The size of each trench was approximately 3 feet wide (the width of the excavator bucket) by 10 feet long. Excavated soil from each of these four trenches was temporarily stockpiled next to the trench, then replaced upon completion of the sampling effort. These trenches were excavated to the native material beneath the landfill, which varied in depth.

The purpose of Trench TR-5 was to excavate and stage for disposal small containers of paint and oil-like material and all visibly contaminated soil and debris from the ground surface. Trench TR-5 was approximately 5 feet wide by 6 feet long. Excavated soil from trench TR-5 was temporarily stockpiled on plastic sheeting near the trench then disposed of with investigation-derived waste (Section 2.8). This trench was excavated to the underlying native material located at an approximate depth of 4 feet bgs.

The landfill material encountered in the trenches consisted of dark brown, sandy gravel with cobbles up to 5 inches in diameter. The material contained debris such as concrete cylinders, concrete beams, black plastic buckets, plastic containers, plastic sheeting, metal buckets, metal strapping, broken glass debris, glass containers, and drums of solidified concrete. The native

material consisted of brown, silty, fine to medium sand with organic material such as roots. A more detailed account of the sampling in each trench follows and is presented in Table 2-7.

Trench TR-1 (SS-026-04, SS-026-05, and SS-026-07). Samples SS-026-04 and SS-026-05 were collected from the landfill material at depths of 4 and 5 feet bgs, respectively, and sample SS-026-07 was collected from the native material. Sample SS-026-05 was selected from directly beneath an empty, crushed, and rusted drum that was marked as previously containing diesel. This drum contained an oily material on the outside, emitted a hydrocarbon-like odor, and registered a reading of 60 ppm on the PID. This sample was analyzed for the presence of petroleum hydrocarbons in addition to the analytical methods presented in the beginning of Section 2.1 and Table 2-2. One drum of solidified concrete also was removed from this trench, staged with the other debris, and disposed of at the end of the investigation.

Eight VOCs, 17 SVOCs, cyanide, and 24 metals were detected in the two landfill material soil samples collected from this trench. Pesticides or PCB hydrocarbon mixtures were not detected in samples of landfill material collected from this trench. Diesel-range and heavy-oil-range hydrocarbons were detected in sample SS-026-05. Two VOCs and 19 metals were detected in the native material sample (SS-026-07). No SVOCs, pesticides, PCB hydrocarbon mixtures, or cyanide was detected in the native material sample collected from this trench.

Trench TR-2 [SS-027-04 (SS-327-04 duplicate), and SS-027-13]. Sample SS-027-04 (SS-327-04 duplicate) was collected from the landfill material at a depth of 4 feet bgs. Sample SS-027-13 was collected from the native material at a depth of 13 feet bgs. No drums were encountered in this trench.

Eight VOCs, 22 SVOCs, one pesticide, and 23 metals were detected in the landfill material sample and duplicate. Seven VOCs, one SVOC, and 19 metals were detected in the native material sample. No PCB hydrocarbon mixtures or cyanide was detected in these samples.

Trench TR-3 (SS-028-05 and SS-028-11). Sample SS-028-05 was collected from the landfill material at a depth of 5 feet bgs. Sample SS-028-11 was collected from the native material at a depth of 11 feet bgs. No drums were encountered in this trench, but numerous small, glass vials and containers similar to sampling jars were uncovered at approximately 5 feet bgs. The jars contained material that appeared to be orange paint and white grease. These containers registered readings of 20 to 60 ppm on the PID. These samples were analyzed for petroleum hydrocarbons in addition to the analytes presented in the beginning of Section 2.1 and Table 2-2.

Ten VOCs, 11 SVOCs, one pesticide, Aroclor® 1254 and Aroclor® 1260, diesel-range and heavy-oil-range hydrocarbons, and 22 metals were detected in the landfill sample. Cyanide was not detected. Seven VOCs, four SVOCs, Aroclor® 1254, diesel-range and heavy-oil-range

hydrocarbons, and 23 metals were detected in the native material sample. Pesticides and cyanide were not detected.

Trench TR-4 (SS-029-05 and SS-029-10). Sample SS-029-05 was collected from the landfill material at a depth of 5 feet bgs. Sample SS-029-10 was collected from the native material at a depth of 10 feet bgs. No drums were encountered in this trench.

Six VOCs, 15 SVOCs, Aroclor® 1254, and 22 metals were detected in the landfill material sample. No pesticides or cyanide was detected in this sample collected from this trench. One VOC, three SVOCs, and 18 metals were detected in the native material sample. No pesticides, PCB hydrocarbon mixtures, or cyanide was detected.

Trench TR-5 (SS-033-01 and SS-033-04). Debris at and below the surface of this trench included metal gasoline cans, large and small metal paint cans, metal paint thinner containers, and miscellaneous glass and plastic containers similar to sampling jars. Some of these miscellaneous jars contained liquid or viscous materials that appeared to be oil, asphalt, or paint. The products in these containers were later sampled and analyzed (Section 2.5). The paint cans and these miscellaneous containers appeared minimally to moderately deteriorated. The remaining containers and debris generally appeared rusted, deteriorated, and partially intact.

Sample SS-033-01 was collected from the surface of this trench. This sample was analyzed for the presence of petroleum hydrocarbons in addition to the methods presented in the beginning of Section 2.1 and Table 2-2. A strong odor of paint thinner and visible staining were present in the trench from the surface to approximately 2 feet bgs. Maximum PID readings of 650 ppm were detected at the surface. Sample SS-033-04 was collected from the native material at an approximate depth of 4 feet bgs. A PID reading of 3.4 ppm was detected at this depth, but no abnormal staining or odor was present. All visibly contaminated soil and debris excavated from this trench was staged on plastic sheeting and later disposed of by a licensed waste disposal contractor (Section 2.8).

Nineteen VOCs, two SVOCs, Aroclor® 1254 and Aroclor® 1260, 21 metals, and cyanide were detected in the landfill material sample. Ten VOCs, 12 SVOCs, two pesticides, Aroclor® 1260, and 21 metals were detected in the native material sample. Cyanide was not detected in the native material sample.

Drum Removal and Concrete Drum Sampling

Drums partially exposed on the surface of the landfill and uncovered during trenching activities were removed and staged on plastic sheeting in a designated area of the landfill using the excavator. Nine of these drums were approximately 35 gallons in size, had sensors arrayed around the outside, and contained solidified concrete. Thirteen 55-gallon drums containing

solidified concrete, two empty 55-gallon drums, and seven 5-gallon (or smaller) empty containers were removed from the surface and subsurface of the landfill. These drums and containers were disposed of with investigation-derived waste by a licensed waste disposal contractor (Section 2.8).

One sample (DC-001) and duplicate (DC-301) were collected from representative drums of hardened concrete to identify the contents for disposal. Concrete chip samples were collected using a decontaminated chisel and hammer, then were transferred to laboratory-provided glassware. Eight VOCs, 11 SVOCs, Aroclor® 1260, and 23 metals were detected.

2.1.9 Umatilla Army Depot Borrow Site Material

Five soil samples (US-001 through US-005) and one duplicate (US-304) were collected from the 33 buckets containing soil from the Umatilla Army Depot Borrow Site that were stored at the former NPD laboratory site. Table 2-8 specifies buckets or bags from which soil samples were collected for this investigation.

Discrete samples were collected from buckets labeled "94-BH-2A (2/2)" (US-001), "94-BH-4B (1/2)" (US-002), and "94-BH-4A (1/3)" (US-003). Two composite samples (US-004 [US-304] and US-005) were collected using soil from the remaining buckets. Material in several of the buckets was not used for sampling because it was not suitable for laboratory analysis (i.e., had coarse gravel and cobbles too large for laboratory sample containers). Soil from buckets specified in the management plan for discrete sampling ("94-BH-2B") was inadvertently included in sample US-005, or was too coarse for sampling. Likewise, soil from buckets specified in the management plan for discrete sampling ("94-BH-3A") was not sampled because both buckets with this label contained stones or rocks too large for laboratory testing.

These samples were collected with hand tools and a stainless steel bowl using sampling procedures described in the management plan (URS 2001). The Umatilla Army Depot Borrow Site material was disposed of with investigation-derived waste by a licensed waste disposal contractor (Section 2.8).

Seven SVOCs and 21 metals were detected in the soil samples. No pesticides, PCB hydrocarbon mixtures, explosives, or chemical agent breakdown products were detected in these samples.

2.2 SAMPLING OF SEDIMENT IN CONCRETE SUMP

Sample SD-001 (SD-301 duplicate) was collected from the base of the concrete sump. Approximately 900 gallons of standing water were removed prior to sampling the sediment. The water was pumped through a garden hose using a new sump pump and, with permission, to a

City of Troutdale sanitary sewer manhole. The concrete sump appeared to be intact, with sediment and water accumulated in it. Therefore, the sump does not appear to leak.

The sediments were collected using a sample rod and a Teflon® sampling cup as described in the management plan (URS 2001). The sediment sample and duplicate sample were analyzed for the presence of VOCs, SVOCs, pesticides, PCBs, metals (plus strontium and uranium), and cyanide using EPA SW-846 methods. The samples also were analyzed for total petroleum hydrocarbons using method NWTPH-Dx (Table 2-2).

Thirteen VOCs, 14 SVOCs, Aroclor® 1242 and Aroclor® 1260, diesel-range and heavy-oil-range hydrocarbons, and 22 metals were detected in the sediment sample collected from the concrete sump. See Tables 2-3 through 2-6 for detected analytical results and Appendix B for all analytical results.

2.3 GROUNDWATER INVESTIGATION

2.3.1 Installation and Development

Groundwater samples and water level measurements were collected from five temporary microwells (MC-1 through MC-5) and six existing monitoring wells (MW-1 through MW-6) (Figure 2-1) as described in Section 2.3.2. The monitoring wells were installed at the site during a previous groundwater study (Tetra Tech 1998). The following temporary microwells were installed during this investigation:

- One microwell (MC-1) was installed in the drainage ditch upstream (south) of the hazardous materials storage shed, near the soil sample location SS-004 in the former drainage ditch soil removal area.

- One microwell (MC-2) was installed north of the former dry well soil removal area, between soil sampling locations SS-012 and SS-030.

- Three microwells (MC-3, MC-4, and MC-5) were installed on the west side of the former laboratory facility to determine any possible impact on groundwater from former laboratory practices.

The temporary microwells were installed at the site using the Geoprobe® direct-push technique. The microwells were installed, developed, and abandoned in accordance with the management plan (URS 2001), except as noted in Section 2.9. For installation of a temporary microwell, a Geoprobe® boring was advanced to 20 feet bgs. The prepacked polyvinyl chloride (PVC) well screen and riser were inserted down the center of the push rods. The screen was constructed of

¾-inch-inside-diameter, schedule 40 PVC with 0.010-inch slots (10 slot) and was 15 feet in length. The sand pack in the prepacked screen consisted of 10-20 silica sand. Monitoring well and microwell information is presented in Table 2-9.

The temporary microwells were allowed to stabilize for more than 24 hours after installation and prior to development. Because of the small diameter of the microwells, development involved low-flow pumping until water quality parameters (dissolved oxygen [DO], oxidation-reduction potential [ORP]), pH, specific conductance, temperature, and turbidity) stabilized. The stabilization guidelines achieved were three successive readings within ± 0.1 for pH; ± 3 percent for conductance; ± 10 percent for temperature, turbidity, and DO; ± 10 millivolts (mV) for ORP; and a turbidity reading of 10 nephelometric turbidity units (NTUs) or less. The information was documented on monitoring well development data sheets (Appendix A). The development water was stored in 55-gallon drums and disposed of as described in Section 2.8.

2.3.2 Sampling

Monitoring wells MW-1, MW-2, MW-5, and MW-6, and the five microwells were sampled in September 2001. During water level measurements conducted in September 2001, debris that appeared to be grass or roots was encountered in wells MW-3 through MW-6. The grass or roots caused plugs to form in MW-3 and MW-4. These wells were sampled in February 2002 instead of September 2001 because the wells required redevelopment to remove the grass or root plugs. During sampling in February 2002, grass or root plugs again were present in the wells. Monitoring wells MW-1 through MW-6 were sampled again in April 2003.

The monitoring wells and microwells were purged and sampled in accordance with the management plan (URS 2001), except as noted in Section 2.9. A low-flow, minimal drawdown technique using a ¾-inch QED Environmental Systems, Inc. bladder pump was used for groundwater purging and sampling. The pump was decontaminated prior to use on each well, and disposable bladders and tubing were used. Specific conductance, temperature, pH, DO, turbidity, and ORP were measured during purging using a water quality meter with a flow-through cell. Final groundwater parameter measurements are presented in Table 2-10. Sampling data sheets are presented in Appendix A. Groundwater samples from the bladder pumps were collected into laboratory-supplied sample containers directly from the end of the pump discharge tubing. Dissolved metals samples were filtered by attaching a 0.45-micrometer (µm) filter to the end of the tubing. The samples were analyzed for the presence of VOCs, SVOCs, pesticides, PCBs, total and dissolved metals, and total cyanide using EPA SW-846 methods.

The minimal amount of purge water generated during low-flow purging and sampling was contained temporarily, then disposed of as investigation-derived waste by a licensed waste disposal contractor (Section 2.8). Padlocks provided by the USACE were placed on each monitoring well after sampling was complete; the existing padlocks were discarded. After

completion of sampling, the temporary microwells were decommissioned according to Oregon guidelines.

2.3.3 Analytical Results

Detected groundwater analytical results are summarized in Tables 2-11 and 2-12 and Appendix B contains all analytical results. In the groundwater sample collected from the former drainage ditch removal area (MC-1), two VOCs (carbon tetrachloride and PCE) were detected and no SVOCs, pesticides, PCBs, or cyanide was detected. In the former dry well removal area (MC-2) and at one microwell location west of the former laboratory (MC-3), one SVOC (benzoic acid) and no VOCs, pesticides, PCBs, or cyanide was detected. No VOCs, SVOCs, pesticides, PCBs, or cyanide was detected in the remaining two microwell samples west of the former laboratory (MC-4 and MC-5).

At the background well (MW-1), one pesticide (methoxychlor) and no VOCs, SVOCs, PCBs, or cyanide was detected in April 2003. The pesticide was not detected in the sample collected in September 2001. Near the main building, one SVOC (phenanthrene) and no VOCs, pesticides, PCBs, or cyanide was detected in MW-3 in September 2001.

Near the landfill in September 2001/February 2002, one VOC (TCA) was detected in MW-6 and three SVOCs were detected in MW-4. In April 2003, two SVOCs were detected in MW-6.

Twenty-two total metals and 22 dissolved metals were detected in one or more microwell or monitoring well groundwater samples.

2.3.4 Water Level Measurements

Static water levels were measured in the six monitoring wells and five microwells within a period of 2 hours on September 15, 2001. Measurements also were collected April 9, 2003, within a 1-hour period in the six monitoring wells only. Measurements and elevations are presented in Table 2-13.

During field activities in September 2001, the depth to groundwater was generally 10 to 12 feet below top of casing (btoc). During sampling of monitoring wells MW-3 and MW-4 in February 2002, depths to groundwater in these two flush-mount wells were 5.52 feet btoc and 7.48 feet btoc, respectively. These measurements were approximately 5 feet shallower in February 2002 than in September 2001 (10.72 feet btoc and 12.62 feet btoc, respectively). During the April 2003 sampling event, depths to groundwater ranged from 3.64 feet btoc to 10.99 feet btoc.

Groundwater elevations in September 2001 ranged from 22.82 feet mean sea level (msl) in monitoring well MW-6, located north of the landfill, to 26.53 feet msl in MW-1, located at the

south end of the site (Table 2-13). As shown on Figure 2-2, the groundwater flow direction in September 2001 beneath most of the site generally was toward the north. However, localized flow beneath the south portion of the site was toward the west and east. The hydraulic gradient across the site in September 2001 from MW-1 to MW-6 was 0.0035 foot per foot. In the south portion of the site the water table was nearly flat and the hydraulic gradient was 0.0009 foot per foot. The hydraulic gradient was steeper (0.006 foot per foot) beneath the landfill.

In April 2003, the calculated groundwater elevations in the six monitoring wells ranged from 31.03 feet msl in MW-1 at the south boundary of the site, to 31.97 feet msl in MW-5, located north of the landfill. As shown in Figure 2-3, the groundwater flow in April 2003 was nearly flat and flowed slightly in a southerly direction. Localized groundwater flow beneath the landfill was toward the west, south, and southeast. The hydraulic gradient across the site in April 2003 was 0.001 foot per foot.

2.4 COMPARISON OF ANALYTICAL DETECTIONS TO REGULATORY SCREENING VALUES

This section summarizes the analytical detections that exceed regulatory screening values designated for this project. It does not incorporate results of the human health risk evaluation conducted for this project that are discussed in Section 4.4.

2.4.1 Concrete, Sediment, and Soil

Concentrations of contaminants detected in concrete, sediment, and soil samples were compared to EPA Region 9 Preliminary Remediation Goals (PRGs) for industrial soil (USEPA 2000a). The analytes and concentrations in concrete, sediment, and soil that exceed applicable screening values are summarized in Table 2-14. Figure 2-4 presents the locations and concentrations of detected contaminants that exceed project screening values.

The following are results of a comparison of analytical detections of concrete, sediment, and soil samples with project screening values.

- The detections of arsenic in the concrete sample and duplicate exceed the PRG.
- In the primary and duplicate samples of sediment from the concrete sump, arsenic, chromium, and Aroclor® 1242 were detected at concentrations that exceed the respective PRGs.
- Concentrations of benzo(a)pyrene in a soil sample and duplicate collected from the base of the fuel oil tank vault exceed the PRG.

- Arsenic and benzo(a)pyrene concentrations in samples of landfill material from the north toe and exploratory trenches TR-1 through TR-4 exceed the PRG.

- The concentration of 1,2-dibromoethane in the sample collected from landfill trench TR-5 exceeds the PRG.

2.4.2 Groundwater

Concentrations detected in groundwater samples were compared to EPA Region 9 PRGs for tap water (USEPA 2000a), EPA maximum contaminant levels (MCLs) (USEPA 2000b), and EPA ambient water quality criteria (AWQC) (USEPA 1999a). The analytes and concentrations in groundwater that exceed applicable screening values are summarized below and in Table 2-15 and are shown on Figure 2-5.

- Estimated concentrations of total arsenic detected in MW-1, MW-4, and MW-5 during the April 2003 sampling event exceed the PRG and AWQC values.

- Estimated concentrations of dissolved arsenic detected in all samples (except from MW-3 and MW-4) in September 2001 and in MW-1, MW-4, and MW-5 in April 2003 exceed the PRG and AWQC values.

- The estimated concentrations of carbon tetrachloride and dissolved arsenic detected in MC-1 (drainage ditch) exceeds project screening values.

2.5 SAMPLING OF PRODUCT CONTAINERS IN LANDFILL

Product enclosed in the glass and plastic containers that were discovered at trench TR-5 was sampled for waste characterization purposes. Seven glass or plastic jars (8 to 12 ounces each) were temporarily staged on plastic with the drums at the site (Section 2.1.8). The material was segregated based on two types of material: a white and orange viscous material that appeared to be paint, and an oily, dark, semi-viscous material. In January 2002, each group was composited for analysis. Sample PD-001 contained the paint-like material, and sample PD-002 (PD-302 duplicate) contained the oil-like material. The samples were analyzed for VOCs, SVOCs, pesticides, PCB hydrocarbon mixtures, metals, cyanide, reactive cyanide, reactive sulfide, pH, and flashpoint using EPA SW-846 methods. All of the material was required to fill the sampling containers; the minimal volume of residual product that remained in the original containers was disposed of with IDW (Section 2.8). See Table 2-16 for detected analytes in product samples.

Five VOCs, eight SVOCs, two pesticides, and 19 metals were detected in the paint-like product material sampled from small containers in the landfill (PD-001); cyanide, reactive cyanide, and

reactive sulfide were not detected in this sample. The pH of the material was 5.19, and the flashpoint was 115 degrees Fahrenheit (°F).

Three VOCs, two SVOCs, and 17 metals were detected in the oil-like product material sampled from small containers in the landfill (PD-002 and PD-302 duplicate). Pesticides, PCB hydrocarbon mixtures, reactive cyanide, and reactive sulfide were not detected. Cyanide was detected in the duplicate sample. The pH of the material was 6.05 (6.11, duplicate), and the flashpoint was 104°F (106°F, duplicate).

2.6 DECONTAMINATION OF SAMPLING EQUIPMENT

Equipment used during the field investigation and sampling activities was decontaminated before use at the site and between sampling locations to prevent cross-contamination. The specific procedures used to ensure proper decontamination are outlined in this section.

The excavator bucket used for trenching in the landfill was cleaned between trench locations. It was decontaminated using a hot-water pressure washer within the landfill fenced area away from the sampling areas. The wash water was allowed to infiltrate into the ground surface.

Before initial use, all nondisposable sampling equipment that could have contributed to the contamination of a sample was thoroughly decontaminated, unless specific documentation existed to show that the sampling equipment had already been decontaminated. Precleaned equipment in factory-sealed containers (i.e., Geoprobe® sampler liners and pump bladders and tubing) did not require decontamination. Nondisposable equipment that required decontamination included the downhole Geoprobe® equipment (push-probe rods and soil samplers); stainless steel spoons, bowls, and trowels used in soil sampling; chisel used in concrete sampling; cup and rods used in sediment sampling; and the bladder pump used in groundwater sampling.

The sampling equipment was decontaminated between sampling locations according to the procedure outlined in the management plan:

1. The equipment was thoroughly scrubbed with phosphate-free detergent and potable water; a brush was used to remove any particulate matter or surface film.

2. The inside and outside of the equipment was thoroughly rinsed with clean, potable water.

3. The inside and outside of the equipment was thoroughly rinsed with clean, laboratory-supplied water free of analytes of concern.

4. The equipment was rinsed with reagent-grade methanol using a Teflon®-lined squirt bottle.

5. The equipment was rinsed with reagent-grade hexane using a Teflon®-lined squirt bottle.

6. The equipment was allowed to air dry, and wrapped if not used immediately.

Potable water was obtained from a nearby City of Troutdale hydrant under permit. Waste methanol and hexane were allowed to evaporate. Decontamination wash water was stored in 55-gallon drums prior to disposal (Section 2.8).

2.7 SURVEYING

A licensed surveying subcontractor, Olson Engineering, Inc., of Vancouver, Washington, surveyed all soil sampling locations and temporary microwell locations created during this investigation. Horizontal coordinates were obtained for all soil sampling locations and reported in North American Datum of 1983 (NAD83). Vertical elevations were obtained for ground surface and top of temporary microwell casings and reported in North American Vertical Datum of 1988 (NAVD). Groundwater sampling location coordinates and monitoring elevations are presented in Table 2-9. Soil sampling location coordinates are presented in Table 2-17.

2.8 DISPOSAL OF LANDFILL AND INVESTIGATION-DERIVED WASTE

Investigation-derived waste included soil cuttings generated during Geoprobe® sampling, purge water generated during development and sampling, and decontamination wash water. Landfill waste included drums removed from the landfill and visibly contaminated soil, containers, and debris excavated from trench TR-5 in the landfill (Section 2.1.8). Other waste disposed of was 5-gallon plastic buckets containing Umatilla Army Depot Borrow Site material.

Soil cuttings were contained in one 55-gallon drum, and water was contained in two 55-gallon drums. The drums were properly marked and stored in an onsite building. Drums, containers, soil, and debris originating from the landfill were staged on plastic sheeting within the landfill fenced area.

Landfill and investigation-derived waste was disposed of in February 2002 by an independent, licensed, waste disposal contractor (Envirotech Systems Incorporated of Lynnwood, Washington). The soil cuttings and water were transported in the three drums in which they were stored. The remaining waste was loaded into a roll-off container by the waste disposal

contractor representatives. A total of 21,500 pounds of waste was transported to and disposed of at Columbia Ridge Landfill and Recycling Center in Arlington, Oregon. The waste was classified nonhazardous. Disposal manifests and certificates are presented in Appendix C.

2.9 DEVIATIONS FROM THE MANAGEMENT PLAN

This investigation was carried out in accordance with the management plan (URS 2001), with the following exceptions:

- Vegetation was removed by hand—not by a mower.
- Background samples SS-001-12, SS-032-01, and SS-032-14 were added to the investigation during field activities at the request of the USACE representatives.
- Samples SS-030-10 and SS-031-10, located in the former dry well area, were added to the investigation during field activities at the request of the USACE representatives. The purpose of these samples was to determine whether potential contamination observed in boring SS-012 had migrated further downgradient.
- Exploratory trench TR-5 was added to the investigation at the request of the USACE representatives. The purpose of this trench was to investigate and remove containers and excavate all visibly contaminated soil and debris from the ground surface in this landfill location. The material was disposed of as described in Section 2.8.
- Two product types in seven containers removed from the ground surface at the location of trench TR-5 were sampled and analyzed (Section 2.5) at the request of the USACE representatives.
- To ensure worker safety, exploratory trench soil samples were collected from the excavator bucket using hand tools instead of a slide hammer on the wall of the trench and a Geoprobe® at the base of the trench.
- According to the management plan, the maximum number of 35-gallon drums of hardened concrete expected to be removed from the landfill was 10. However, in addition to the 9 such drums encountered, 13 55-gallon concrete drums, 2 empty 55-gallon drums, and 7 empty 5-gallon (or smaller) containers were removed, staged, and disposed of.

- Additional sample SS-026-05 was collected from trench TR-1 beneath a crushed drum encountered in the trench. Small containers similar to sampling jars were encountered in trench TR-3, so additional samples SS-028-05 and SS-028-11 were collected from that trench. Sample SS-033-01 was collected from the surface of trench TR-5, where evidence of contamination was present, and sample SS-033-04 was sampled from the underlying native material. In addition to the analytes specified in the management plan, these samples (except SS-033-04) were analyzed for petroleum hydrocarbons using Method NWTPH-Dx.

- The Umatilla Army Depot Borrow Site material in several of the buckets was not used for sampling because it was not suitable for laboratory analysis (i.e., consisted of material too large for sampling containers and laboratory analysis). Soil from buckets specified in the management plan for discrete sampling (94-BH-2B) was inadvertently included in sample US-005 or was too coarse for sampling. Likewise, soil from buckets specified in the management plan for discrete sampling (94-BH-3A) was not sampled because both buckets with this label contained only coarse material.

- Approximately 900 gallons of water was removed from the concrete sump to access the sediment at the base for sampling. The water was pumped into the City of Troutdale sanitary sewer with permission. Because of a visible heavy sheen, the sediment sample also was analyzed for petroleum hydrocarbons at the request of a USACE representative.

- Microwells MC-1 and MC-2 were installed as much as 10 feet from borings SS-004 and SS-012, rather than in the boring. Because the temporary microwells required decommissioning 36 hours after installation, they were installed at a later date to adhere to 7-day holding times for groundwater samples. Therefore, to avoid contamination from bentonite backfill, they were offset from the original borings.

- Survey information for temporary microwell MC-1 was not available due to an oversight by the surveying subcontractor.

- Monitoring wells MW-3 and MW-4 were sampled in February 2002 instead of during the scheduled field activities in September 2001. The wells required redevelopment due to the presence of grass debris.

- To obtain additional groundwater data, monitoring wells MW-1 through MW-6 were sampled again in April 2003. The samples were analyzed for the same parameters as during the previous round.

- The additional drums and containers removed from the landfill and the soil and debris removed from the location of exploratory trench TR-5 were disposed of with investigation-derived waste.

- Concentrations of contaminants detected in concrete, sediment, and soil samples were compared to EPA Region 9 PRGs for industrial soil. Concentrations detected in groundwater samples were compared to EPA Region 9 PRGs for tap water (USEPA 2000a), EPA MCLs (USEPA 2000b), and EPA AWQC (USEPA 1999a).

Table 2-1
Summary of Sampling Locations and Methods

Sample ID	Sampling Location	Depth (feet bgs)	Matrix	Sampling Method
Background Locations				
SS-001-01	Southeast portion of site near utility vault	0-1	Soil	Geoprobe®
SS-001-12	Southeast portion of site near utility vault	11-12	Soil	Geoprobe®
SS-002-01	Drainage ditch in landfill	0-1	Soil	Geoprobe®
SS-032-01	Southwest portion of site	0-1	Soil	Geoprobe®
SS-032-14	Southwest portion of site	13-14	Soil	Geoprobe®
Drainage Ditch				
SS-003-01	Freeze-thaw drain	0-1	Soil	Geoprobe®
SS-003-05	Freeze-thaw drain	4-5	Soil	Geoprobe®
SS-004-03	Sump drain and former removal area (native material)	2-3	Soil	Geoprobe®
SS-004-09	Sump drain and former removal area (native material, above water table)	8-9	Soil	Geoprobe®
SS-005-01	East of landfill	0-1	Soil	Hand tools
SS-006-01	Drain plug to former hazardous material storage building	0-1	Soil	Geoprobe®
SS-006-05	Drain plug to former hazardous material storage building	4-5	Soil	Geoprobe®
SS-007-01	Former oil storage building	0-1	Soil	Geoprobe®
SS-007-05	Former oil storage building	4-5	Soil	Geoprobe®
SS-008-01	Corner of NW Graham Road	0-1	Soil	Geoprobe®; Associated field blank: SS 608-01
SS-008-05	Corner of NW Graham Road	4-5	Soil	Geoprobe®
MC-001	Sump drain and former removal area; Near SS-4	--	Groundwater	Microwell, low-flow technique
Dry Well				
SS-009-08	West of former dry well	7-8	Soil	Geoprobe®
SS-009-11	West of former dry well	10-11	Soil	Geoprobe®
SS-010-08	South of former dry well	7-8	Soil	Geoprobe®
SS-310-08	South of former dry well	7-8	Soil	Duplicate of SS-010-08
SS-010-12	South of former dry well	11-12	Soil	Geoprobe®
SS-011-08	Southeast of former dry well	7-8	Soil	Geoprobe®
SS-011-11	Southeast of former dry well	10-11	Soil	Geoprobe®
SS-012-08	North of former dry well	7-8	Soil	Geoprobe®
SS-012-11	North of former dry well	10-11	Soil	Geoprobe®; Odor like paint thinner

Table 2-1 (Continued)
Summary of Sampling Locations and Methods

Sample ID	Sampling Location	Depth (feet bgs)	Matrix	Sampling Method
Dry Well (Continued)				
SS-312-11	North of former dry well	10-11	Soil	Geoprobe®; Duplicate of SS-012-11
SS-013-10	Former dry well removal area (native)	9-10	Soil	Geoprobe®
SS-013-12	Former dry well removal area (native, above water table)	11-12	Soil	Geoprobe®
SS-030-10	North of former dry well and SS-012	9-10	Soil	Geoprobe®
SS-031-10	Northwest of former dry well	9-10	Soil	Geoprobe®
MC-002	North (downgradient) of former dry well removal area; Between SS-12 and SS-30	--	Groundwater	Microwell, low-flow technique
MC-302	North (downgradient) of former dry well removal area; Between SS-12 and SS-30	--	Groundwater	Microwell, low-flow technique; Duplicate of MC-002; Associated field blank: MC-602
Building Cleanout Pipe				
SS-014-04	Cleanout pipe (southernmost)	3-4	Soil	Geoprobe®
SS-015-05	Cleanout pipe	4-5	Soil	Geoprobe®
SS-016-05	Cleanout pipe (northernmost)	4-5	Soil	Geoprobe®
Transformer Pad				
SS-017-01	Outside fence; south of transformer pad	0-1	Soil	Hand tools
SS-018-01	Outside fence; south of transformer pad	0-1	Soil	Hand tools
SS-019-01	Outside fence; south of transformer pad	0-1	Soil	Hand tools
SS-319-01	Outside fence; south of transformer pad	0-1	Soil	Hand tools; Duplicate of SS-019-01
SS-020-01	Inside fence; north of transformer pad	0-1	Soil	Hand tools
Fuel Oil Tank Vault				
SS-021-04	Former fuel oil tank location	3-4	Soil	Geoprobe®
SS-321-04	Former fuel oil tank location	3-4	Soil	Geoprobe®; Duplicate of SS-021-04
Landfill—Trenches				
SS-026-04	Trench TR-1 - landfill material	4	Soil	Backhoe bucket
SS-026-05	Trench TR-1 - landfill material; drum	5	Soil	Backhoe bucket; Crushed drum with petroleum odor

Table 2-1 (Continued)
Summary of Sampling Locations and Methods

Sample ID	Sampling Location	Depth (feet bgs)	Matrix	Sampling Method
Landfill—Trenches (Continued)				
SS-026-07	Trench TR-1 - native material	7	Soil	Backhoe bucket
SS-027-04	Trench TR-2 - landfill material	4	Soil	Backhoe bucket
SS-327-04	Trench TR-2 - landfill material	4	Soil	Backhoe bucket; Duplicate of SS-027-04
SS-027-13	Trench TR-2 - native material	13	Soil	Backhoe bucket
SS-028-05	Trench TR-3 - landfill material	5	Soil	Backhoe bucket
SS-028-11	Trench TR-3 - native material	11	Soil	Backhoe bucket; Associated field blank: SS-628-11
SS-029-05	Trench TR-4 - landfill material	5	Soil	Backhoe bucket
SS-029-10	Trench TR-4 - native material	10	Soil	Backhoe bucket
SS-033-01	Trench TR-5 - landfill material; product containers	1	Soil	Hand tools; Containers on surface of landfill
SS-033-04	Trench TR-5 - native material	4	Soil	Backhoe bucket
Landfill—North Toe				
SS-022-01	North toe of landfill (easternmost)	0-1	Soil	Hand tools
SS-023-01	North toe of landfill	0-1	Soil	Hand tools
SS-323-01	North toe of landfill	0-1	Soil	Hand tools; Duplicate of SS-023-01; Associated field blank: SS-623-01
SS-024-01	North toe of landfill	0-1	Soil	Hand tools
SS-025-01	North toe of landfill (westernmost)	0-1	Soil	Hand tools
Landfill—Concrete Drum				
DC-001	Concrete from landfill drum	--	Concrete	Concrete chip
DC-301	Concrete from landfill drum	--	Concrete	Concrete chip; Duplicate of DC-001
Umatilla Army Depot Borrow Site Material				
US-001	5-gallon buckets	--	Soil	Hand tools
US-002	5-gallon buckets	--	Soil	Hand tools
US-003	5-gallon buckets	--	Soil	Hand tools; Associated field blank: US-603
US-004	5-gallon buckets	--	Soil	Hand tools
US-304	5-gallon buckets	--	Soil	Hand tools; Duplicate of US-004
US-005	5-gallon buckets	--	Soil	Hand tools
Sediment in Concrete Sump				
SD-001	Sediment from concrete sump	--	Sediment	Teflon® cup and rods
SD-301	Sediment from concrete sump	--	Sediment	Teflon® cup and rods; Duplicate of SD-001

Table 2-1 (Continued)
Summary of Sampling Locations and Methods

Sample ID	Sampling Location	Depth (feet bgs)	Matrix	Sampling Method
Product Containers in Landfill				
PD-001	Product containers from surface of trench TR-5	--	Product	Hand tools
PD-002	Product containers from surface of trench TR-5	--	Product	Hand tools
PD-302	Product containers from surface of trench TR-5	--	Product	Hand tools; Duplicate of PD-002
West of Former Laboratory				
MC-003	West of main building (southernmost)	--	Groundwater	Microwell, low-flow technique
MC-004	West of main building	--	Groundwater	Microwell, low-flow technique
MC-005	West of main building (northernmost)	--	Groundwater	Microwell, low-flow technique
Monitoring Wells				
MW-001	Southern portion of site near utility vault	--	Groundwater	Monitoring well, low-flow technique
MW-002	Northeast corner of main building	--	Groundwater	Monitoring well, low-flow technique
MW-003	Northwest of main building	--	Groundwater	Monitoring well, low-flow technique
MW-303	Northwest of main building	--	Groundwater	Monitoring well, low-flow technique; Duplicate of MW-003
MW-004	East of landfill	--	Groundwater	Monitoring well, low-flow technique
MW-005	Northeast of landfill	--	Groundwater	Monitoring well, low-flow technique
MW-006	Northwest of landfill	--	Groundwater	Monitoring well, low-flow technique

Note:
bgs - below ground surface

Table 2-2
Summary of Analytical Program

Parameter	Analytical Method	Background Locations (Soil)	Drainage Ditch (Soil)	Dry Well (Soil)	Building Cleanout Pipe (Soil)	Transformer Pad (Soil)	Fuel Oil Tank Vault (Soil)	Landfill (Soil)	Landfill Drums (Concrete)	Concrete Sump (Sediment)	Landfill Containers (Product)	Microwells and Monitoring Wells (Groundwater)	Umatilla Army Depot Borrow Site Material (Soil)
Volatile organic compounds	EPA SW-846 Method 8260B modified	X	X	X	X		X	X	X	X	X	X	
Semivolatile organic compounds	EPA SW-846 Method 8270C	X	X	X	X		X	X	X	X	X	X	X
Pesticides and PCB hydrocarbon mixtures	EPA SW-846 Method 8081A/8082	X	X	X	X			X	X	X	X	X	X
PCB hydrocarbon mixtures	EPA SW-846 Method 8082					X							
Total/dissolved metals [a]	EPA SW-846 Method 6010B/6020	X	X	X	X			X	X	X	X	X	X
Total/dissolved mercury	EPA SW-846 Method 7470A/7471A											X	
Total cyanide	EPA SW-846 Method 9012/9013	X	X	X	X			X	X	X	X	X	
Diesel-range and heavy-oil-range hydrocarbons	NWTPH-Dx modified						X	X [b]		X	X		
Explosives (nitramine and nitroaromatic compounds)	EPA SW-846 Method 8330												X
Chemical agent breakdown products	Southwest Research Institute SOPs												X
Reactive cyanide	EPA SW-846 Chapter 7.3.3										X		
Reactive sulfide	EPA SW-846 Chapter 7.3.4										X		
pH (corrosivity)	EPA Method 9040B										X		
Flashpoint (ignitability)	EPA Method 1010										X		

[a]Metals include aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, silver, sodium, strontium, thallium, uranium, vanadium, and zinc.
[b]Select samples

Table 2-3
Detections of TPH and VOCs in Concrete, Sediment, and Soil Samples

Analyte	Landfill Drum Concrete		Sump Sediment		Background Soil				
	DC-001 9/14/01	DC-301 9/14/01 Duplicate	SD-001 9/14/01	SD-301 9/14/01 Duplicate	SS-001-01 9/5/01	SS-001-12 9/11/01	SS-002-01 9/7/01	SS-032-01 9/7/01	SS-032-14 9/7/01
TPH (mg/kg)									
Diesel-range hydrocarbons	--	--	1,090	619	--	--	--	--	--
Motor-oil-range hydrocarbons	--	--	4,230	2,360	--	--	--	--	--
VOCs (mg/kg)									
1,1,1-Trichloroethane	0.402 J	0.43 J	3.41	0.755	--	--	--	--	--
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--
1,2-Dibromoethane	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	--	--	--	--	--	--	--	--	--
2-Butanone	12.1 J	11.1 J	28.6 J	13.7 J	2.05 J	--	1.46	1.94	0.689 J
2-Hexanone	--	--	--	--	--	--	--	--	--
4-Methyl-2-pentanone	--	--	--	3.67	--	--	--	--	--
Acetone	41.8 J	52 J	126 J	59.7 J	--	13.9 J	--	--	--
Benzene	--	--	1.27	1.01	--	--	--	0.358	--
Bromomethane	--	--	--	--	--	--	--	--	--
Carbon Disulfide	--	0.726 J	13.3 J	7.21 J	--	--	--	--	--
Carbon Tetrachloride	--	--	43.8 D	9.33 D	--	--	--	--	--
Chlorobenzene	--	--	--	--	--	--	--	--	--
Chloroform	--	--	26.1	11.3	--	--	--	--	--
Chloromethane	--	--	--	--	--	--	--	--	0.2 J
Dichlorodifluoromethane	--	--	--	--	--	--	--	--	--
Ethylbenzene	--	1.55	1.66	1.1	--	--	--	--	--
Isopropylbenzene	--	--	--	--	--	--	--	--	--
m,p-Xylene	--	17.5	1.9	1.06	--	--	--	--	--
Methyl Acetate	--	--	--	--	--	--	--	--	--
Methylcyclohexane	--	--	1.37	1.05	--	--	--	--	--
Methylene Chloride	--	--	12.8 J	--	--	--	--	--	--
o-Xylene	--	7.43	--	0.444	--	--	--	--	--
Styrene	--	0.461 J	--	--	--	--	--	--	--
Toluene	--	--	--	--	--	--	--	--	--
Trichloroethene	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane	--	--	--	--	--	--	--	--	--

Table 2-3
Detections of TPH and VOCs in Concrete, Sediment, and Soil Samples

Analyte	Drainage Ditch Soil								Dry Well Soil	
	SS-003-01 9/6/01	SS-003-05 9/6/01	SS-004-03 9/6/01	SS-004-09 9/6/01	SS-005-01 9/12/01	SS-006-01 9/6/01	SS-007-05 9/6/01	SS-008-01 9/6/01	SS-010-08 9/5/01	SS-310-08 9/5/01 Duplicate
TPH (mg/kg)										
Diesel-range hydrocarbons	--	--	--	--	--	--	--	--	--	--
Motor-oil-range hydrocarbons	--	--	--	--	--	--	--	--	--	--
VOCs (mg/kg)										
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	--
1,2-Dibromoethane	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--
2-Butanone	8.12	8.96	--	2.89 J	2.98 J	12.8 J	1.36 J	1.17 J	0.714 J	1.17 J
2-Hexanone	--	--	--	--	--	--	--	--	--	--
4-Methyl-2-pentanone	--	--	--	--	--	--	--	--	--	--
Acetone	--	--	--	--	102 J	--	--	--	--	--
Benzene	1.88	--	--	--	0.957	0.438	--	--	--	--
Bromomethane	--	--	--	--	--	0.465	--	--	--	--
Carbon Disulfide	0.831	--	0.585 J	1.33 J	1.25 J	--	--	--	--	--
Carbon Tetrachloride	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	--	--	--	--	--	--	--	--	--	--
Chloroform	--	--	--	--	--	--	--	--	--	--
Chloromethane	--	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane	0.287 J	--	--	--	--	--	--	--	--	--
Ethylbenzene	--	--	--	--	--	--	--	--	--	--
Isopropylbenzene	--	--	--	--	--	--	--	--	--	--
m,p-Xylene	--	--	--	--	1.43 J	--	--	--	--	--
Methyl Acetate	10.3 J	--	--	--	9.06 J	2.62 J	--	--	--	--
Methylcyclohexane	--	--	--	--	--	--	--	--	--	--
Methylene Chloride	--	--	--	--	--	--	--	--	--	--
o-Xylene	--	--	--	--	0.568 J	--	--	--	--	--
Styrene	--	--	--	--	--	--	--	--	--	--
Toluene	--	--	--	--	--	--	--	--	--	--
Trichloroethene	--	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane	0.593	--	--	--	18.9	--	--	--	--	--

Table 2-3
Detections of TPH and VOCs in Concrete, Sediment, and Soil Samples

Analyte	Dry Well Soil (Continued)					Cleanout Pipe Soil		Fuel Oil Tank Vault Soil	
	SS-012-08 9/5/01	SS-012-11 9/5/01	SS-312-11 9/5/01 Duplicate	SS-013-10 9/5/01	SS-013-12 9/5/01	SS-014-04 9/5/01	SS-016-05 9/5/01	SS-021-04 9/7/01	SS-321-04 9/7/01 Duplicate
TPH (mg/kg)									
Diesel-range hydrocarbons	--	--	--	--	--	--	--	92.5	92
Motor-oil-range hydrocarbons	--	--	--	--	--	--	--	629	525
VOCs (mg/kg)									
1,1,1-Trichloroethane	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--
1,2-Dibromoethane	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	--	--	--	--	--	--	--	--	--
2-Butanone	1.48 J	1.52 J	1.78 J	1.33 J	--	3.21 J	1.31 J	1.11 J	1.27 J
2-Hexanone	--	--	--	--	--	--	--	--	--
4-Methyl-2-pentanone	--	--	--	--	1.36 J	--	--	--	--
Acetone	--	--	--	--	172 J	--	--	--	--
Benzene	--	--	--	--	--	0.406 J	--	--	--
Bromomethane	--	--	--	--	--	--	--	--	--
Carbon Disulfide	--	--	--	--	0.842 J	--	--	--	0.154 J
Carbon Tetrachloride	--	--	--	--	--	--	--	--	--
Chlorobenzene	--	--	--	--	--	--	--	--	--
Chloroform	--	--	--	--	--	--	--	--	--
Chloromethane	--	--	--	--	--	--	--	0.199 J	--
Dichlorodifluoromethane	0.271 J	--	--	--	--	0.342 J	--	--	--
Ethylbenzene	--	--	--	--	--	--	--	--	--
Isopropylbenzene	--	--	--	--	--	--	--	--	--
m,p-Xylene	--	--	--	--	--	--	--	--	--
Methyl Acetate	--	--	--	--	33.6 J	3.21 J	--	--	--
Methylcyclohexane	--	--	--	--	--	--	--	--	--
Methylene Chloride	--	--	--	--	--	--	--	--	--
o-Xylene	--	--	--	--	--	--	--	--	--
Styrene	--	--	--	--	--	--	--	--	--
Toluene	--	--	--	--	--	--	--	--	--
Trichloroethene	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane	0.676	--	--	--	--	--	--	--	--

Table 2-3
Detections of TPH and VOCs in Concrete, Sediment, and Soil Samples

Analyte	Landfill North Toe Soil					Landfill Trench TR-1 Soil			Landfill Trench TR-2 Soil		
	SS-022-01 9/14/01	SS-023-01 9/14/01	SS-323-01 9/14/01 Duplicate	SS-024-01 9/14/01	SS-025-01 9/14/01	SS-026-04 9/10/01	SS-026-05 9/10/01	SS-026-07 9/10/01	SS-027-04 9/11/01	SS-327-04 9/11/01 Duplicate	SS-027-13 9/11/01
TPH (mg/kg)											
Diesel-range hydrocarbons	--	--	--	--	--	--	22.8 J	--	--	--	--
Motor-oil-range hydrocarbons	--	--	--	--	--	--	137	--	--	--	--
VOCs (mg/kg)											
1,1,1-Trichloroethane	--	0.489	0.655 J	0.628 J	--	6.36	6.79	1.23	--	0.56	0.415
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromoethane	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--
2-Butanone	27 J	14.4 J	19.4 J	21.8 J	7.19 J	1.46	9.69	--	12.6 J	14 J	1.06 J
2-Hexanone	1.59 J	1.12 J	--	--	--	--	1.82	--	--	--	--
4-Methyl-2-pentanone	--	--	--	--	--	--	--	--	--	--	--
Acetone	232 J	121 J	168 J	191 J	72.3 J	--	41.4 J	13.3 J	136 J	124 J	25.9 J
Benzene	2.07	1.86	3.17	3.71	15.7	--	0.395	--	0.385	0.729	0.451
Bromomethane	--	--	--	--	--	--	--	--	--	--	--
Carbon Disulfide	0.59 J	0.717 J	0.778 J	0.742 J	38.8 J	0.159 J	3.65 J	--	1.2 J	3.09 J	0.216 J
Carbon Tetrachloride	--	--	--	--	--	--	--	--	--	--	10.4
Chlorobenzene	--	--	--	--	--	--	--	--	--	--	--
Chloroform	--	--	--	--	--	--	--	--	--	--	--
Chloromethane	--	--	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	--	--	--	--	--	--	--	--	--	--	--
Isopropylbenzene	--	--	--	--	--	--	--	--	--	--	--
m,p-Xylene	--	--	--	1.2 J	--	--	--	--	--	--	--
Methyl Acetate	--	--	--	--	--	--	--	--	5.84	--	--
Methylcyclohexane	--	--	--	--	--	0.132 J	0.209 J	--	--	--	--
Methylene Chloride	--	--	--	--	--	--	--	--	--	--	--
o-Xylene	--	--	--	0.525 J	--	--	--	--	--	--	--
Styrene	--	--	--	--	--	--	--	--	--	--	--
Toluene	--	--	--	--	--	--	--	--	--	--	--
Trichloroethene	--	0.215 J	--	--	--	--	--	--	--	0.907	2.12
Trichlorofluoromethane	--	--	--	--	--	1.83	--	--	8.49	--	--

Table 2-3
Detections of TPH and VOCs in Concrete, Sediment, and Soil Samples

Analyte	Landfill Trench TR-3 Soil		Landfill Trench TR-4 Soil		Landfill Trench TR-5 Soil	
	SS-028-05 9/11/01	SS-028-11 9/11/01	SS-029-05 9/12/01	SS-029-10 9/12/01	SS-033-01 9/12/01	SS-033-04 9/12/01
TPH (mg/kg)						
Diesel-range hydrocarbons	25.8	165	--	--	31,200	--
Motor-oil-range hydrocarbons	117	760	--	--	10,600	--
VOCs (µg/kg)						
1,1,1-Trichloroethane	--	0.437 J	--	--	--	--
1,1,2,2-Tetrachloroethane	--	--	--	--	38.6 J	--
1,2-Dibromoethane	--	--	--	--	111 J	--
1,2-Dichlorobenzene	--	--	--	--	0.627 J	--
1,3-Dichlorobenzene	--	--	--	--	161 J	--
1,4-Dichlorobenzene	--	--	--	--	1.93 J	--
2-Butanone	13 J	39	4.37 J	--	213 J	20.7 J
2-Hexanone	2.57	7.56	--	--	3140 J	--
4-Methyl-2-pentanone	--	--	--	--	--	--
Acetone	107 J	213 J	35.8 J	16.3 J	1280 J	202 J
Benzene	0.772	1.39	0.687	--	--	1.5
Bromomethane	--	--	--	--	10.2 J	--
Carbon Disulfide	4.84 J	1.6 J	15.2 J	--	0.566 J	0.762 J
Carbon Tetrachloride	--	--	--	--	--	--
Chlorobenzene	--	--	--	--	14.7 J	--
Chloroform	--	--	--	--	--	--
Chloromethane	--	--	--	--	--	--
Dichlorodifluoromethane	--	--	--	--	--	1.01
Ethylbenzene	1.02	--	0.247 J	--	85.3 J	0.603 J
Isopropylbenzene	--	--	--	--	7.69 J	--
m,p-Xylene	4.45	--	--	--	139 J	2.77
Methyl Acetate	--	--	--	--	--	7.96
Methylcyclohexane	0.781	--	0.315 J	--	600 J	--
Methylene Chloride	--	--	--	--	1.7 J	--
o-Xylene	1.81	--	--	--	60.8 J	0.899
Styrene	--	--	--	--	46.8 J	--
Toluene	3.04	--	--	--	56 J	--
Trichloroethene	--	--	--	--	--	--
Trichlorofluoromethane	--	1.19	--	--	--	11.7

Notes:
-- - analyte was not detected
D - value derived from a dilution
J - value estimated
µg/kg - microgram per kilogram
mg/kg - milligram per kilogram
TPH - total petroleum hydrocarbons
VOCs - volatile organic compounds

Table 2-4
Detections of SVOCs in Concrete, Sediment, and Soil Samples

Analyte	Landfill Drum Concrete		Concrete Sump Sediment		Background Soil		Drainage Ditch Soil					
	DC-001 9/14/01	DC-301 9/14/01 Duplicate	SD-001 9/14/01	SD-301 9/14/01 Duplicate	SS-002-01 9/7/01	SS-032-01 9/7/01	SS-003-01 9/6/01	SS-004-03 9/6/01	SS-004-09 9/6/01	SS-005-01 9/12/01	SS-006-01 9/6/01	SS-007-01 9/6/01
SVOCs (mg/kg)												
1,2-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dimethylphenol	1.73 J	--	--	--	--	--	--	--	--	--	--	--
2,6-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	--	--	12.9	7.7	--	--	1.46	--	--	--	--	--
3- & 4-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitrophenol	--	--	66.2	--	--	--	--	--	--	--	--	--
Acenaphthene	--	--	--	--	--	--	--	--	--	1.57	--	--
Acenaphthylene	--	--	53.3	56.2	--	--	7.97	--	--	--	--	--
Anthracene	--	--	--	62.4	--	--	5.98	--	--	1.85	--	--
Benzo(a)anthracene	4.08	2.54 J	171	169	--	--	30.8	--	--	15.9	--	--
Benzo(a)pyrene	2.72	1.87	276	203	--	1.78	48.2	--	--	26.5	3.45	--
Benzo(b)fluoranthene	3.71	2.54	169	--	--	2.29	69	--	1.77	38.7	4.89	--
Benzo(g,h,i)perylene	--	--	161	74.9	--	1.91	40.7	--	--	22.5	3.16	--
Benzo(k)fluoranthene	--	--	60.2	--	--	--	28.7	--	--	11.8	2.16	--
Benzoic Acid	--	--	--	--	--	--	--	--	--	--	--	--
Benzyl Alcohol	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl	--	--	--	--	--	--	--	--	--	--	--	--
bis(2-Ethylhexyl)phthalate	--	--	--	--	--	--	--	--	--	--	--	--
Butylbenzylphthalate	--	--	--	--	5.13 J	3.57 J	--	3.07 J	--	--	4.03 J	4.11 J
Chrysene	4.2	3.2	145	196	--	--	36.4	--	--	22.6	--	--
Di-n-octylphthalate	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzo(a,h)anthracene	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	2.27 J	6.95 J	--	--	--	--	--	--	--	--	--
Diethylphthalate	--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	9.88	5.61	186	135	--	3.44	53.2	--	--	24.5	3.31	--
Fluorene	--	19.6	--	--	--	--	1.33	--	--	--	--	--
Indeno(1,2,3-cd)pyrene	--	--	--	--	--	--	27.8	--	--	15.7	2.3	--
n-Nitrosodiphenylamine	--	8.94	--	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	--	27.8	72.3	37	--	--	13.3	--	--	9.53	--	--
Pyrene	6.42	4.94	241	195	3.7	4.71	42.5	--	--	27.9	3.16	--

Table 2-4
Detections of SVOCs in Concrete, Sediment, and Soil Samples

Analyte	Drainage Ditch Soil (Continued)		Dry Well Soil			Cleanout Pipe Soil	Fuel Oil Tank Vault Soil		Landfill North Toe Soil			
	SS-007-05 9/6/01	SS-008-01 9/6/01	SS-009-08 9/5/01	SS-010-12 9/5/01	SS-013-12 9/5/01	SS-016-05 9/5/01	SS-021-04 9/7/01	SS-321-04 9/7/01 Duplicate	SS-022-01 9/14/01	SS-023-01 9/14/01	SS-323-01 9/14/01 Duplicate	SS-024-01 9/14/01
SVOCs (mg/kg)												
1,2-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dimethylphenol	--	--	--	--	--	--	--	--	--	--	--	--
2,6-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	7.07 J	--
2-Methylnaphthalene	--	--	--	--	--	--	144	146	--	24.3	3.13	4.9
3- & 4-Methylphenol	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	--	--	--	--	--	--	266	292	16.2	289	36.3	53.2
Acenaphthylene	--	--	--	--	--	--	28.2	36.4	45.7	28.6	12	12.7
Anthracene	--	--	--	--	--	--	712	888	35.4	484	76.4	104
Benzo(a)anthracene	--	--	--	--	--	--	1,220	1,470	202	564	231	236
Benzo(a)pyrene	--	--	--	--	--	1.33	1,260	1,960	482	906	283	316
Benzo(b)fluoranthene	--	--	--	--	--	1.21	830	1,120	--	--	--	--
Benzo(g,h,i)perylene	--	--	--	--	--	--	398	675	165	--	152	164
Benzo(k)fluoranthene	--	--	--	--	--	--	358	668	--	--	--	--
Benzoic Acid	--	--	--	--	--	--	--	--	174 J	--	21.9 J	--
Benzyl Alcohol	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl	--	--	--	--	--	--	--	--	--	--	--	2.52 J
bis(2-Ethylhexyl)phthalate	--	--	--	--	--	--	--	--	--	--	--	--
Butylbenzylphthalate	5.3 J	4.82 J	--	--	--	--	--	--	--	--	--	--
Chrysene	--	--	--	--	--	--	1,460	1,900	186	500	264	278
Di-n-octylphthalate	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzo(a,h)anthracene	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	43.5 J	48.1 J	--	162	16.1	25.2
Diethylphthalate	--	--	2.61 J	--	--	--	--	--	--	--	--	--
Fluoranthene	--	--	--	--	4.38	1.45	1,560	1,840	278	1,750	428	447
Fluorene	--	--	--	--	--	--	294	321	19.2	273	33.9	43.6
Indeno(1,2,3-cd)pyrene	--	--	--	--	--	--	253	261	--	--	--	--
n-Nitrosodiphenylamine	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	--	--	--	1.35	--	--	2,800	3,410	81	1,270	218	279
Pyrene	--	--	--	--	--	1.81	3,060	3,690	351	1,340	387	409

Table 2-4
Detections of SVOCs in Concrete, Sediment, and Soil Samples

Analyte	Landfill North Toe Soil (Cont.)	Landfill Trench TR-1 Soil		Landfill Trench TR-2 Soil		Landfill Trench TR-3 Soil			Landfill Trench TR-4 Soil		Landfill Trench TR-5 Soil	
	SS-025-01 9/14/01	SS-026-04 9/10/01	SS-026-05 9/10/01	SS-027-04 9/11/01	SS-327-04 9/11/01 Duplicate	SS-027-13 9/11/01	SS-028-05 9/11/01	SS-028-11 9/11/01	SS-029-05 9/12/01	SS-029-10 9/12/01	SS-033-01 9/12/01	SS-033-04 9/12/01
SVOCs (mg/kg)												
1,2-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dimethylphenol	--	--	--	--	--	--	--	--	--	--	--	--
2,6-Dinitrotoluene	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	--	--	2.91	20.9	3.88	--	--	--	--	--	7,740	2.81
3- & 4-Methylphenol	--	--	--	4.75 J	--	--	--	--	--	--	--	--
4-Nitrophenol	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	--	--	4.37	239	30.1	--	--	--	2.46	--	--	--
Acenaphthylene	58.7	--	1.85	5.01	8.61	--	2.78	--	--	--	--	--
Anthracene	41.8	--	6.89	317	53	--	3.9	--	3.69	--	--	--
Benzo(a)anthracene	129	25.7	41.7	560	171	--	14.5	--	16.4	--	--	26.5
Benzo(a)pyrene	214	40.3	70.9	438	147	2.12	28.4	--	23.1	--	--	49.2
Benzo(b)fluoranthene	167	95.3	108	517	150	--	33	--	32	--	--	65.9
Benzo(g,h,i)perylene	114	47.7	67.2	238	76.8	--	36.9	--	23.4	--	--	47.2
Benzo(k)fluoranthene	97.9	--	33.9	203	100	--	24.8	--	11.1	--	--	30.1
Benzoic Acid	--	--	--	--	8.12 J	--	--	--	24.7 J	--	--	91.4
Benzyl Alcohol	--	--	--	--	--	--	--	--	--	--	--	--
Biphenyl	--	--	--	10.7 J	--	--	--	--	2.73 J	--	--	--
bis(2-Ethylhexyl)phthalate	--	--	--	1,410 D	--	--	--	--	--	--	--	--
Butylbenzylphthalate	--	--	--	--	--	--	--	--	--	--	--	--
Chrysene	144	34.2	51	408	146	--	17.7	--	17.5	--	--	32.5
Di-n-octylphthalate	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzo(a,h)anthracene	--	--	12.2	56.9	30.5	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	122	18.1	--	--	--	--	--	--	--
Diethylphthalate	--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	217	30.6	62.9	1,330 D	355	--	--	22.4	47.5	4.07	--	42
Fluorene	--	--	3.18	205	40.2	--	--	--	3.28	--	--	--
Indeno(1,2,3-cd)pyrene	79.6	23.2	47.8	228	75.4	--	27.6	--	17.3	--	--	28
n-Nitrosodiphenylamine	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	68.8	--	--	--	--	--	--	43,400	--
Pentachlorophenol	--	--	12.1 J	--	--	--	--	1,120	--	--	--	--
Phenanthrene	71.8	--	32.6	1,050 D	232	--	8.63	19.8	14.3	3.6	--	13.8
Pyrene	239	34.2	66.4	1,000 D	274	--	25.2	30.3	28	5.39	--	44

Table 2-4
Detections of SVOCs in Concrete, Sediment, and Soil Samples

Analyte	Umatilla Army Depot Borrow Site Material					
	US-001 9/12/01	US-002 9/12/01	US-003 9/13/01	US-004 9/13/01	US-304 9/13/01 Duplicate	US-005 9/14/01
SVOCs (mg/kg)						
1,2-Dichlorobenzene	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--	--
1,4-Dichlorobenzene	--	--	--	--	--	--
2,4-Dimethylphenol	--	--	--	--	--	--
2,6-Dinitrotoluene	--	--	--	--	--	--
2-Methylnaphthalene	3.11	2.27	--	6.1	6.2	3.06
3- & 4-Methylphenol	--	--	--	--	--	--
4-Nitrophenol	--	--	--	--	--	--
Acenaphthene	--	--	--	--	--	--
Acenaphthylene	--	--	--	--	--	--
Anthracene	--	--	--	--	--	--
Benzo(a)anthracene	--	--	--	--	--	--
Benzo(a)pyrene	--	--	--	--	--	--
Benzo(b)fluoranthene	--	--	--	2.16	--	--
Benzo(g,h,i)perylene	--	--	--	--	--	--
Benzo(k)fluoranthene	--	--	--	--	--	--
Benzoic Acid	--	--	--	--	--	--
Benzyl Alcohol	15.7	--	--	--	--	--
Biphenyl	--	--	--	--	--	--
bis(2-Ethylhexyl)phthalate	--	--	--	--	--	--
Butylbenzylphthalate	--	--	--	--	--	--
Chrysene	--	--	--	--	--	--
Di-n-octylphthalate	9.44 J	3.41 J	--	--	--	--
Dibenzo(a,h)anthracene	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--
Diethylphthalate	--	--	--	--	--	--
Fluoranthene	2.99	--	--	2.16	--	--
Fluorene	--	--	--	--	--	--
Indeno(1,2,3-cd)pyrene	--	--	--	--	--	--
n-Nitrosodiphenylamine	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	--
Phenanthrene	--	--	--	2.29	--	--
Pyrene	2.07	--	1.84	2.67	--	--

Notes:
-- - analyte was not detected
D - value derived from a dilution
J - value estimated
µg/kg - microgram per kilogram
SVOCs - semivolatile organic compounds

Table 2-5
Detections of Pesticides and PCB Hydrocarbon Mixtures in Concrete, Sediment, and Soil Samples

Analyte	Landfill Drum Concrete		Concrete Sump Sediment		Background Soil	Drainage Ditch Soil		
	DC-001 9/14/01	DC-301 9/14/01 Duplicate	SD-001 9/14/01	SD-301 9/14/01 Duplicate	SS-001-12 9/11/01	SS-003-01 9/6/01	SS-004-09 9/6/01	SS-005-01 9/12/01
Pesticides and PCBs (mg/kg)								
4,4'-DDD	--	--	--	--	--	--	--	--
4,4'-DDE	--	--	--	--	--	--	--	--
4,4'-DDT	--	--	--	--	2.48	--	2.71	1.19
Aroclor 1242	--	--	6,060 D	3,920 D	--	--	--	--
Aroclor 1254	--	--	--	--	--	30.4	--	--
Aroclor 1260	15.9	9.87 J	465	168	--	--	--	--

Table 2-5
Detections of Pesticides and PCB Hydrocarbon Mixtures in Concrete, Sediment, and Soil Samples

Analyte	Transformer Pad Soil					Landfill North Toe Soil	Landfill Trench TR-2 Soil
	SS-017-01 9/10/01	SS-018-01 9/10/01	SS-019-01 9/10/01	SS-319-01 9/10/01 Duplicate	SS-020-01 9/10/01	SS-024-01 9/14/01	SS-027-04 9/11/01
Pesticides and PCBs (mg/kg)							
4,4'-DDD	--	--	--	--	--	1.25 J	--
4,4'-DDE	--	--	--	--	--	8.79	--
4,4'-DDT	--	--	--	--	--	25.4	0.588
Aroclor 1242	--	--	--	--	--	--	--
Aroclor 1254	7 J	26	56	52	130	26.5	--
Aroclor 1260	--	--	--	--	--	--	--

Table 2-5
Detections of Pesticides and PCB Hydrocarbon Mixtures in Concrete, Sediment, and Soil Samples

Analyte	Landfill Trench TR-3 Soil		Landfill Trench TR-4 Soil	Landfill Trench TR-5 Soil	
	SS-028-05 9/11/01	SS-028-11 9/11/01	SS-029-05 9/12/01	SS-033-01 9/12/01	SS-033-04 9/12/01
Pesticides and PCBs (mg/kg)					
4,4'-DDD	--	--	--	--	--
4,4'-DDE	--	--	--	--	0.861
4,4'-DDT	23.1	--	--	--	2.26
Aroclor 1242	--	--	--	--	--
Aroclor 1254	54.8	4.77 J	67.1 J	904 D	--
Aroclor 1260	69.4	--	--	111	9.26 J

Notes:
-- - analyte was not detected
D - value derived from a dilution
J - value estimated
µg/kg - microgram per kilogram
PCBs - polychlorinated biphenyls

Table 2-6
Detections of Metals and Cyanide in Concrete, Sediment, and Soil Samples

Analyte	Landfill Drum Concrete		Concrete Sump Sediment		Background Soil				
	DC-001 9/14/01	DC-301 9/14/01 Duplicate	SD-001 9/14/01	SD-301 9/14/01 Duplicate	SS-001-01 9/5/01	SS-001-12 9/11/01	SS-002-01 9/7/01	SS-032-01 9/7/01	SS-032-14 9/7/01
Conventionals (mg/kg)									
Cyanide	--	--	--	--	--	--	--	--	--
Metals (mg/kg)									
Aluminum	6,290	5,140	11,300	12,300	2,000 J	1,660	2,560	3,030	1,320
Antimony	18.9	13	--	--	--	2.6 J	--	1.53 J	0.962 J
Arsenic	21.1 J	20.1 J	23.7 J	23.4 J	--	--	--	--	--
Barium	101	99.1	212	206	9.11	4.42	13.8	19.4	4.8
Beryllium	--	--	--	0.293 J	--	--	--	--	--
Cadmium	0.81	0.99	2.12	1.85	0.3	0.233	0.491	0.421	0.299
Calcium	84,800	68,100	25,100 J	25,100 J	1,110 J	1,460 J	1,380 J	1,350 J	1,530 J
Chromium	44.6	35.8	101	99.4	--	--	6.26	--	--
Cobalt	10.6	11.4	10.5	11.5	1.57 J	2.43	3.82 J	3.35 J	3.08 J
Copper	32.6	33.5	272	277	11.1	14.5 J	13.8	13.4	10.3
Iron	19,000	20,100	31,000 J	31,100 J	3,260	5,790	10,100 J	7,720 J	6,260 J
Lead	6.11	6.75	273 J	290 J	0.73	0.835	0.456	0.845	0.393
Magnesium	4,260	4,320	13,500 J	15,700 J	227 J	246	336 J	492 J	222 J
Manganese	360	324	464 J	450	32.1	40	110	68	40.6
Mercury	0.0247	--	31.3	23.7	0.034 J	--	--	0.0169 J	--
Nickel	8.32	10.4	96.1	95.6	1.89	2.63	3.83	3.77	2.94
Potassium	948	658	1,960	2,540	58.1 J	113 J	--	140 J	66 J
Selenium	1.9 J	1.59 J	2.72 J	2.83 J	--	--	--	--	--
Silver	0.137	0.163	12.8	12.2	0.045	0.0858	0.0719	0.0688	0.0556
Sodium	440	--	--	--	357	236 J	205	301	217 J
Strontium	155	140	95.4	101	5.91 J	18.7	10.9 J	12.7 J	10.4 J
Uranium	0.605	0.666	0.747	0.66	0.0681	0.0955	0.0994	0.124	0.136
Vanadium	46.5	48	51.8	53.7	12.3	23.4	38.7	26	25.7
Zinc	184	165	741	723	5.64	12.3	11.4	14.4	12.6

Table 2-6
Detections of Metals and Cyanide in Concrete, Sediment, and Soil Samples

Analyte	Drainage Ditch Soil								
	SS-003-01 9/6/01	SS-003-05 9/6/01	SS-004-03 9/6/01	SS-004-09 9/6/01	SS-005-01 9/12/01	SS-006-01 9/6/01	SS-006-05 9/6/01	SS-007-01 9/6/01	SS-007-05 9/6/01
Conventionals (mg/kg)									
Cyanide	--	--	--	--	--	--	--	--	--
Metals (mg/kg)									
Aluminum	4,050 J	1,330 J	1,760	1,640	12,700	3,410	2,570	2,390	2,350
Antimony	--	--	2.04 J	--	2.41 J	--	--	--	--
Arsenic	1.15	--	--	--	1.04	0.456	--	--	--
Barium	49	13.2	12.8	13.2	66.1	46.1	20.7	21.5	15.6
Beryllium	--	--	--	--	0.206 J	--	--	--	--
Cadmium	0.617	0.267	0.441	0.336	1.19	0.77	0.458	0.693	0.436
Calcium	2,230 J	1,410 J	1,490 J	1,330 J	4,240 J	2,780 J	1,720 J	1,530 J	1,580 J
Chromium	10.4	2.62	5.21	--	13.7	6.41	5.88	6.07	5.06
Cobalt	5.36 J	1.66 J	2.99 J	3.07 J	8.84	3.71 J	3.57 J	3.37 J	2.96 J
Copper	26.5	9.06	10.1	9.97	66.9 J	13.6	12.3	10.7	10.7
Iron	10,200	3,580	6,670 J	6,780 J	16,000	8,290 J	7,910 J	7,370 J	6,720 J
Lead	27.2	0.489	1.02	0.911	4.31	8.7	0.582	1.67	0.46
Magnesium	1,360 J	249 J	439 J	493 J	2,410	682 J	511 J	323 J	467 J
Manganese	109	40.4	52.3	54	162	200	61.6	103	54.8
Mercury	4.05 J	0.138 J	0.0673 J	0.0206 J	0.016 J	1.94 J	0.0407 J	0.421 J	0.105 J
Nickel	15.2	2.68	3.8	3.62	12.6	7.05	3.87	4.31	3.7
Potassium	289 J	70.8 J	102 J	106 J	1,080	176 J	151 J	106 J	116 J
Selenium	--	--	--	--	1.58 J	--	--	--	--
Silver	0.505	0.0473	0.107	0.0619	0.23	0.446	0.0885	0.404	0.162
Sodium	--	179 J	348	345	1,370 J	272	430	210	300
Strontium	11.5 J	6.64 J	11.1 J	10.6 J	65.7	18.1 J	15.1 J	11.8 J	12.7 J
Uranium	0.254	0.0434	0.0525	0.0653	0.693	0.117	0.0667	0.0566	0.0605
Vanadium	37.9	12.2	24.4	23.6	55.6	24.2	28.7	26.3	23.3
Zinc	60.6	5.46	16.4	14.5	35.7	28.7	13.3	66.1	37.6

Table 2-6
Detections of Metals and Cyanide in Concrete, Sediment, and Soil Samples

Analyte	Drainage Ditch Soil (Continued)		Dry Well Soil						
	SS-008-01 9/6/01	SS-008-05 9/6/01	SS-009-08 9/5/01	SS-009-11 9/5/01	SS-010-08 9/5/01	SS-310-08 9/5/01 Duplicate	SS-010-12 9/5/01	SS-011-08 9/5/01	SS-011-11 9/5/01
Conventionals (mg/kg)									
Cyanide	--	--	--	--	--	--	--	--	--
Metals (mg/kg)									
Aluminum	2,090	2,470	1,060 J	889 J	1,820 J	1,840 J	1,070 J	1,610 J	903 J
Antimony	--	3.41 J	6.4 J	2.38 J	1.15 J	1.22 J	--	--	--
Arsenic	--	--	--	--	--	--	--	--	--
Barium	10.4	19.3	4.23	4.44	9.3	10.3	4.61	7.69	4.27
Beryllium	--	--	--	--	--	--	--	--	--
Cadmium	0.379	0.481	0.189	0.187	0.355	0.366	0.265	0.387	0.189
Calcium	1,300 J	1,440 J	1,130	1,380	1,290	1,330	1,240	1,330	1,150
Chromium	--	5.74	--	--	--	--	--	--	--
Cobalt	2.51 J	3.45 J	1.55	1.53	1.76	1.88	1.56	1.74	1.18
Copper	10.2	13.7	13.7	8.2	27.5	35.8	9.95	10.2	8.09
Iron	5,570 J	7,070 J	3,170	3,610	4,020	3,930	3,620	3,940	3,150
Lead	2.12	0.539	0.315	0.227	0.404	0.43	0.29	0.363	0.251
Magnesium	301 J	419 J	175	171	271	349	222	204	166
Manganese	47.1	66.5	22.3	26	33	32.3	24.6	30.5	26.2
Mercury	0.0889 J	0.0687 J	0.0134 J	0.0144 J	--	--	--	0.0143 J	0.0153 J
Nickel	3.82	3.79	1.89 J	1.82 J	2.26	2.45	1.78 J	1.8 J	1.48 J
Potassium	--	127 J	63.3 J	68.5 J	95.9 J	101 J	74.9 J	89.3 J	57.4 J
Selenium	--	--	--	--	--	--	--	--	--
Silver	0.218	0.0784	0.0311	0.0292	0.0495	0.0543	0.0556	0.0498	0.0255
Sodium	140 J	376	--	180 J	298	242	203	206	135 J
Strontium	10.9 J	12.1 J	5.39	6.68	12.5	13.7	7.67	12	6.47
Uranium	0.0666	0.122	0.0497	0.0469	0.122	0.103	0.0535	0.0807	0.109
Vanadium	20.1	26.5	13.3	14.5	16	13.6	13.9	15.3	12.6
Zinc	25.7	13.4	6.06	6.56	11.8	11.4	7.59	6.23	5.29

Table 2-6
Detections of Metals and Cyanide in Concrete, Sediment, and Soil Samples

Analyte	Dry Well Soil (Continued)							Cleanout Pipe	
	SS-012-08 9/5/01	SS-012-11 9/5/01	SS-312-11 9/5/01 Duplicate	SS-013-10 9/5/01	SS-013-12 9/5/01	SS-030-10 9/6/01	SS-031-10 9/6/01	SS-014-04 9/5/01	SS-015-05 9/5/01
Conventionals (mg/kg)									
Cyanide	--	--	--	--	--	--	--	--	--
Metals (mg/kg)									
Aluminum	959 J	872 J	1,120 J	796 J	1,450 J	1,250 J	909 J	1,810 J	1,850 J
Antimony	--	--	4.37 J	0.94 J	--	2.16 J	1.02 J	--	--
Arsenic	--	--	--	--	--	--	--	--	--
Barium	3.57	4.85	5.71	4.9	19.6	6.83	25.6	7.26	10.6
Beryllium	--	--	--	--	--	--	--	--	--
Cadmium	0.205	0.209	0.207	0.196	0.232	0.261	0.242	0.213	0.459
Calcium	1,270	1,020	1,200	1,240	1,340	1,280 J	1,160 J	1,140	1,540
Chromium	--	--	--	--	9.98	2.98	--	--	--
Cobalt	0.751 J	0.968	1.32	1.23	2.82	1.62 J	1.21 J	1.59	1.58
Copper	7.89	6.57	8.92	7.47	8.94	8.67	7.86	87.3	10.6
Iron	2,560	2,210	3,380	2,710	5,950	3,630	2,690	3,210	3,130
Lead	0.246	0.336	0.276	0.253	2.07	0.347	1.63	0.95	1.22
Magnesium	177	130	253	163	731	221 J	122 J	251	257
Manganese	18.2	18.2	25.4	26.9	55.5	28.2	20.1 J	38.7	40.9
Mercury	--	0.0135 J	--	--	--	0.0161 J	0.0183 J	0.0172 J	0.0828 J
Nickel	1.09 J	1.13 J	1.52 J	1.4 J	4.43	1.73 J	1.22 J	2.17	2.6
Potassium	64.4 J	63.3 J	78 J	58.7 J	161 J	78.6 J	56.9 J	71.1 J	82.8 J
Selenium	--	--	--	--	--	--	--	--	--
Silver	0.0277	0.103	0.0375	0.034	0.0489	0.0434	0.0369	0.0359	0.0457
Sodium	186 J	221	--	147 J	--	202 J	177 J	--	203 J
Strontium	7.3	6.71	8.49	5.58	9.6	7.2 J	5.31 J	5.72	7.61
Uranium	0.0513	0.0366	0.0483	0.0469	0.0812	0.0698	0.0756	0.0884	0.0606
Vanadium	8.72	8.42	11.9	10.2	18.5	14.3	10.5	11.7	11.4
Zinc	3.69	4.39	5.27	4.32	17.3	6.49	4.62	14.2	16.2

Table 2-6
Detections of Metals and Cyanide in Concrete, Sediment, and Soil Samples

Analyte	Landfill North Toe Soil						Landfill Trench TR-1 Soil		
	SS-016-05 9/5/01	SS-022-01 9/14/01	SS-023-01 9/14/01	SS-323-01 9/14/01 Duplicate	SS-024-01 9/14/01	SS-025-01 9/14/01	SS-026-04 9/10/01	SS-026-05 9/10/01	SS-026-07 9/10/01
Conventionals (mg/kg)									
Cyanide	--	--	--	--	--	--	--	0.22	--
Metals (mg/kg)									
Aluminum	2,470 J	8,300	9,690	8,640	10,500	9,230	6,770	9,640	2,620
Antimony	--	--	--	--	--	3.81 J	1.05 J	1.7 J	1.3 J
Arsenic	--	1.46 J	2.3 J	1.9 J	2.22 J	4.51 J	2.5	3.88	--
Barium	88	85.8	135	138	144	2,580	72.2	90.7	8.19
Beryllium	--	--	0.154 J	0.194 J	0.186 J	0.158 J	0.153 J	0.172 J	--
Cadmium	0.25	1.08	1.02	0.898	1.02	1.29	0.746	1.19	0.363
Calcium	1,630	8,360 J	8,280 J	8,150 J	6,530 J	17,100 J	30,800 J	9,590 J	1,590 J
Chromium	--	13	16.9	18.7	19.6	35.9	22	38.3	--
Cobalt	1.34	11.5	9.85	10.9	14	12.3	8.98	17.2	3.09
Copper	10.8	19.4	30.5	29.7	29.5	46.2	24.3 J	34.5 J	13.1 J
Iron	2,640	24,700	21,600	21,800	24,400	28,500	19,600	28,000	6,810
Lead	1.07	30.2	45.3	43.6	50.5	266	24	33.2	0.678
Magnesium	323	2,910 J	3,330 J	3,460 J	3,510 J	5,820 J	7,540	6,930	362
Manganese	31.7	472	344	406	464	452	367	488	49.3
Mercury	--	0.0263	0.712	0.505	0.899	0.559	0.0263 J	0.0641 J	--
Nickel	1.95	12.6	14.7	16.2	17.2	40.9	14.7	54.2	3.67
Potassium	279 J	805	793	673	904	999	1,070	1,010	115 J
Selenium	--	2.2 J	1.56 J	1.52 J	--	2.02 J	1.79 J	2.33 J	--
Silver	0.0399	0.277	0.719	0.662	0.723	0.631	0.15	0.408	0.302
Sodium	235	--	--	--	--	--	377 J	338 J	370 J
Strontium	10.2	64.8	61.9	58	62.8	83.7	82.6	77.5	19.3
Uranium	0.0802	0.564	0.479	0.486	0.552	0.507	0.377	0.485	0.123
Vanadium	9.17	65	55.2	55.3	64.9	72.8	36	69.3	26.4
Zinc	7.95	98	130	120	97.8	433	115	126	10.8

Table 2-6
Detections of Metals and Cyanide in Concrete, Sediment, and Soil Samples

Analyte	Landfill Trench TR-2 Soil			Landfill Trench TR-3 Soil		Landfill Trench TR-4 Soil		Landfill Trench TR-5 Soil	
	SS-027-04 9/11/01	SS-327-04 9/11/01 Duplicate	SS-027-13 9/11/01	SS-028-05 9/11/01	SS-028-11 9/11/01	SS-029-05 9/12/01	SS-029-10 9/12/01	SS-033-01 9/12/01	SS-033-04 9/12/01
Conventionals (mg/kg)									
Cyanide	--	--	--	--	--	--	--	0.30	--
Metals (mg/kg)									
Aluminum	8,080	7,370	2,880	9,850	8,950	7,760	3,350	4,310	5,690
Antimony	1.08 J	--	--	--	7.03 J	--	--	1.63 J	1.93 J
Arsenic	3.14	3.0	4.11	8.02	2.32	3.57 J	--	1.1 J	0.983 J
Barium	48.5	50.9	13.8	142	69.7	102	7.89	91	57.5
Beryllium	--	--	--	0.317 J	--	0.18 J	--	--	--
Cadmium	0.712	0.763	0.412	1.41	0.948	0.949	0.491	0.51	0.412
Calcium	6,080 J	4,310 J	1,940 J	23,400 J	11,300 J	16,900 J	1,860 J	4,040 J	10,000
Chromium	11.3	13.6	--	17.5	12.1	16.7	--	9.02	9.34
Cobalt	7.66	8.51	3.34	9.84 J	9.51	10.7	4.04	29.1	5.4
Copper	17.1 J	18.9 J	18.5 J	97.7	32.6 J	24.4	14.1	36.3	14.1
Iron	17,800	19,000	9,190	25,400	21,400	23,900	8,760	15,100	11,100
Lead	11.6	15.6	1.52	51.8	14.1	20	0.873	107	11.4
Magnesium	3,030	2,920	577	4,050	4,000	4,780 J	504 J	1,640 J	1,640
Manganese	377	335	65.4	617	420	452	85.9	203	221
Mercury	3.33 J	4.6 J	--	1.48 J	0.2 J	0.0538	--	0.0394	0.0341
Nickel	8.96	10.4	3.67	19.6	13.6	31.4	4.28	6.48	13.4
Potassium	506	534	160 J	776	729	1,170	142 J	326 J	353 J
Selenium	1.86 J	1.39 J	--	2.68 J	1.87 J	1.82 J	--	--	--
Silver	0.771	1.53	0.15	0.43	0.383	0.419	0.117	0.127	0.192
Sodium	287 J	383 J	205 J	--	173 J	--	454	--	--
Strontium	51.1	49.5	26.6	78.9	89.5	75.2	26.1	37.4	36.5
Uranium	0.307	0.358	0.107	0.517	0.394	0.754	0.141	0.203	0.333
Vanadium	48.2	56.2	27.9	49.9	49.9	45.5	30.7	33.1	29.8
Zinc	70.2	76.9	20.1	92.6	69.6	55.8	14.1	162	37.7

Table 2-6
Detections of Metals and Cyanide in Concrete, Sediment, and Soil Samples

Analyte	Umatilla Army Depot Borrow Site Material					
	US-001 9/12/01	US-002 9/12/01	US-003 9/13/01	US-004 9/13/01	US-005 9/14/01	US-304 9/13/01 Duplicate
Conventionals (mg/kg)						
Cyanide	--	--	--	--	--	--
Metals (mg/kg)						
Aluminum	3,610	4,090	4,390	3,660	2,960	3,430
Antimony	0.582 J	--	--	--	1.55 J	--
Arsenic	1.45 J	2.4 J	3.05 J	1.38 J	1.11 J	1.32 J
Barium	76.8	79.9	84	79	65.9	78.6
Beryllium	--	0.176 J	0.162 J	0.182 J	--	--
Cadmium	0.707	0.661	0.728	0.725	0.659	0.746
Calcium	7,900	13,900	17,900	5,430	7,930	5,640
Chromium	--	--	--	--	--	--
Cobalt	8.9	8.03	8.04	8.27	7.43	7.86
Copper	12.7	10.1	11.2	10.4	10.7	11.4
Iron	17,800	17,000	16,700	16,400	17,200	16,100
Lead	--	--	--	--	--	--
Magnesium	3,770	3,870	4,010	3,030	2,850	2,870
Manganese	461	337	354	353	272	324
Mercury	--	--	--	0.0128 J	--	--
Nickel	7.19	7.42	7.39	6.51	5.27	6.38
Potassium	827	1,060	1,130	1,010	560	879
Selenium	--	1.29 J	1.43 J	--	1.15 J	--
Silver	1.97	0.143	0.124	0.123	0.107	0.138
Sodium	--	--	--	--	--	--
Strontium	46.5	48.5	49.8	42.3	42.6	40.9
Uranium	0.331	0.391	0.421	0.298	0.372	0.312
Vanadium	35.1	37.8	36.4	37.9	34.7	35.3
Zinc	33	32.1	30.8	30.5	27.1	27.9

Notes:
-- - analyte was not detected
J - value estimated
mg/kg - milligram per kilogram

Table 2-7
Description of Material Encountered in Landfill

Location	Material Encountered	Outcome of Material and Volume Disposed
Surface of entire landfill	- Eight ~35-gal drums of hardened concrete - Thirteen 55-gal drums of hardened concrete - One 55-gal empty drum	Drums removed from original surface location in landfill then staged for later disposal by licensed waste disposal contractor.
Trench TR-1/ SS-026	- Sandy gravel; cobbles, maximum diameter of 5 in. - One empty 55-gal drum containing residual product; marked as previously containing diesel - One ~35-gal drum of hardened concrete - 6-10-in.-diameter cylinder-shaped concrete cores - White and black plastic sheeting - ~3-gal black plastic buckets - Rusted and deteriorated metal 5-gal buckets - Large (up to ~4 x 4 x 1 ft.) rectangular pieces of concrete (test pours?) - Native material encountered at ~7 ft. bgs	Two drums removed and staged for later disposal by licensed waste disposal contractor. Remaining material returned to trench.
Trench TR-2/ SS-027	- Sandy gravel; cobbles, maximum diameter of 5 in. - 6-10-in.-diameter cylinder-shaped concrete cores - White and black plastic sheeting - ~3-gal black plastic buckets - Large (up to ~4 x 4 x 1 ft.) rectangular pieces of concrete (test pours?) - Native material encountered at ~12 ft. bgs	No drums removed from this trench for disposal. All material returned to trench.
Trench TR-3/ SS-028	- Sandy gravel; cobbles, maximum diameter of 5 in. - Broken glass - Miscellaneous small amber and clear glass sampling containers, jars, vials, and eyedroppers - ~12-oz glass jars: one containing orange paint (?), another containing white grease (?), and another containing oily liquid - 6-10-in.-diameter cylinder-shaped concrete cores - White and black plastic sheeting - ~3-gal black plastic buckets - Large (up to ~4 x 4 x 1 ft.) rectangular pieces of concrete (test pours?) - Native material encountered at ~11 ft. bgs	No drums removed from this trench for disposal. Containers of unidentified paint, grease, or oil staged with concrete drums that were encountered in TR-1 and on landfill surface. Remaining material returned to trench.
Trench TR-4/ SS-029	- Sandy gravel; cobbles, maximum diameter of 5 in. - Concrete blocks and debris (up to ~1 x 6 ft.) - Black plastic sheeting - Metal strapping and other miscellaneous metallic debris (crushed cans?) - Native material encountered at ~11 ft. bgs	No drums removed from this trench for disposal. All material returned to trench.

Table 2-7 (Continued)
Description of Material Encountered in Landfill

Location	Material Encountered	Outcome of Material and Volume Disposed
Trench TR-5/ SS-033	- Visibly contaminated (stained) soil with odor similar to paint or paint thinner - Empty gasoline cans - Approx. 10 empty, rusted, and deteriorated large and small metal paint cans - Empty, rusted, and deteriorated metal paint thinner cans - Miscellaneous plastic and glass sampling containers (8-12 oz), some with oily liquid or asphalt-type liquid - Concrete debris - Plastic debris - Native material encountered at ~4 ft. bgs	Approx. 3 cubic yards of visibly contaminated soil, rock, and debris staged on plastic sheeting for later disposal by licensed waste disposal contractor. Small containers with liquid staged with concrete drums for later disposal by licensed waste disposal contractor.

Note:
bgs - below ground surface

Table 2-8
Umatilla Army Depot Borrow Site Material Samples and Bucket Reference

Sample Type and Bucket(s) Sampled				
US-001	**US-002**	**US-003**	**US-004 (US-304)**	**US-005**
Discrete sample from bucket 2/2 of 94-BH-2A	Discrete sample from bucket 1/2 of 94-BH-4B	Discrete sample from bucket 1/3 of 94-BH-4A	Composite sample from buckets: 1/2 of 94-BH-1A 2/2 of 94-BH-1B 1/2 of 94-BH-6A 2/2 of 94-BH-6A 1/2? of 94-BH-6B 1/2 of 94-BH-7B 2/2 of 94-BH-8C 94-BH-5A (bag) 94-BH-7A (bag) 94-BH-8A (bag) 94-BH-9A (bag)	Composite sample from buckets: 1/2 of 94-BH-2B 2/2 of 94-BH-3B 2/2 of 94-BH-6B 1/2 of 94-BH-7C 1/2 of 94-BH-8B 94-BH-9B (bag) 94-BH-9C (bag) 94-BH-10A (bag) 94-BH-10B (bag)

Note:
Remaining buckets were not sampled due to lack of grain size available for sample; the buckets contained clean, coarse material (gravel and cobbles).

Table 2-9
Monitoring Well and Microwell Information

Well No.	Northing (NAD 1983/1998 in U.S. Survey feet)	Easting (NAD 1983/1998 in U.S. Survey feet)	Top of Casing Elevation (feet msl) (NAVD 1988)	Total Depth (feet bgs)	Screen Interval (feet bgs)
Monitoring Wells					
MW-1	692644.94	7718239.02	42.021	20	4.5 - 19.5
MW-2	693091.53	7718209.14	40.067	20.5	5.0 - 20.0
MW-3	693620.53	7718163.67	36.894	19	2.85 - 17.85
MW-4	693386.68	7718290.22	38.178	19	3.5 - 18.5
MW-5	693715.19	7719098.44	35.493	19	3.35 - 18.35
MW-6	693718.53	7718218.86	35.286	19	3.2 - 18.2
Microwells					
MC-1	NA	NA	NA	20	5.0 - 20.0
MC-2	692722.7	7718285	37.26	20	5.0 - 20.0
MC-3	692752.4	7718073	38.77	20	5.0 - 20.0
MC-4	692845.8	7718078	38.26	20	5.0 - 20.0
MC-5	692936.0	7718073	38.06	20	5.0 - 20.0

Notes:
Monitoring wells MW-1 through MW-6 were resurveyed in February 2003 by the USACE Portland District.
bgs - below ground surface
msl - mean sea level
NA - measurements not available
NAD - North American Datum
NAVD - North American Vertical Datum

Table 2-10
Groundwater Parameter Measurements

Well No.	Specific Conductance (µS/cm)	Dissolved Oxygen (mg/L)	Oxidation-Reduction Potential (mV)	pH (SU)	Temperature (°C)	Turbidity (NTU)
September 2001						
Monitoring Wells						
MW-1	578	6.88	224	6.21	16.8	1
MW-2	432	7.04	221	5.43	16.5	1
MW-3 [a]	70.3	0.23	179	5.48	9.02	6.4
MW-4 [a]	179	0.06	-132	6.34	10.89	0
MW-5	247	8.23	105	5.58	14.7	22
MW-6	500	3.42	155	5.90	12.8	24
Microwells [b]						
MC-1	547	7.45	89	6.21	14.5	12
MC-2	649	7.48	154	6.09	14.4	10
MC-3	334	8.67	174	5.84	18.3	20
MC-4	528	8.95	149	6.05	18.1	26
MC-5	418	7.95	102	6.07	18.0	21
April 2003						
Monitoring Wells						
MW-1	110.7	0.90	141	6.09	14.57	0.0
MW-2	30.8	1.92	278	5.51	11.94	0.0
MW-3	63.0	6.88	273	5.42	11.61	0.0
MW-4	189.9	0.70	-19	6.22	13.91	0.0
MW-5	36.7	2.67	217	5.35	11.68	0.0
MW-6	421.0	2.23	257	6.77	10.63	104.3

[a] Wells MW-3 and MW-4 were sampled in February 2002; remaining wells were sampled in September 2001.
[b] These temporary microwells were decommissioned shortly after sampling.

Notes:
°C - degree Celsius
mg/L - milligram per liter
mV - millivolt
NTU - nephelometric turbidity unit
µS/cm - microsiemen per centimeter
SU - standard unit

Table 2-11
Detections of VOCs and SVOCs in Groundwater Samples

Analyte	Drainage Ditch	Dry Well		West of Former Lab	Background	Main Building	Landfill		
	MC-001 9/14/01	MC-302 9/15/01	Duplicate	MC-003 9/14/01	MW-001 4/11/2003	MW-303 2/13/2002	MW-004 2/13/02	MW-006 9/15/01	MW-006 4/11/2003
VOCs (µg/L)									
1,1,1-Trichloroethane	--	--		--	--	--	--	0.454	--
Carbon tetrachloride	0.281 J	--		--	--	--	--	--	--
Tetrachloroethene	0.331 J	--		--	--	--	--	--	--
SVOCs (µg/L)									
2-Methylphenol	--	--		--	--	--	0.249 J	--	--
3- & 4-Methylphenol	--	--		--	--	--	2.8	--	--
Benzoic acid	--	0.18		0.13	--	--	--	--	0.584 J
Benzyl alcohol	--	--		--	--	--	--	--	0.558 J
Phenanthrene	--	--		--	--	0.0629 J	--	--	--
Phenol	--	--		--	--	--	0.497 J	--	--
Pesticides (µg/L)									
Methoxychlor	--	--		--	0.00728 J	--	--	--	--

Notes:
-- - analyte was not detected
J - value estimated
µg/L - microgram per liter
SVOCs - semivolatile organic compounds
VOCs - volatile organic compounds

Table 2-12
Detections of Total and Dissolved Metals in Groundwater Samples

	Drainage Ditch	Dry Well		West of Former Laboratory	
Analyte	MC-001 9/14/01	MC-002 9/15/01	MC-302 9/15/01 Duplicate	MC-003 9/14/01	MC-004 9/14/01
Total Metals (mg/L)					
Aluminum	0.371	1.5	0.919	2.57	2.02
Antimony	--	--	--	--	--
Arsenic	--	--	--	--	--
Barium	0.00291	0.0108	0.00888	0.0192	0.0175
Beryllium	--	0.000071 J	0.000067 J	0.000082 J	0.0001 J
Cadmium	--	0.000157 J	0.000116 J	0.000271 J	0.000218 J
Calcium	13	12.1	11.8	--	5.18
Cobalt	0.000819	0.000928	0.000771	0.000403 J	0.000438 J
Copper	0.00645	0.0136	0.0127	0.032	0.0295
Iron	0.6	2.87	2.11	1.38	0.965
Lead	0.000148 J	0.000455 J	0.000403 J	0.00077	0.000347 J
Magnesium	1.3	1.91	1.87	1.25	1.34
Manganese	0.02	0.0192	0.0166	0.0172	0.02
Nickel	0.002	0.0016	0.00147	0.00306	0.00233
Potassium	1.7 J	4.01	4.11	2.09	2.46
Selenium	--	--	0.000434 J	--	--
Silver	--	--	--	0.00005 J	--
Sodium	9.8	48.4	50.2	9.68	18.3
Strontium	0.0357	0.0529	0.0494	0.035	0.0384
Uranium	--	0.000149	0.000138	0.000157	0.000134
Vanadium	0.00637	0.0198	0.0161	0.0201	0.018
Zinc	--	--	--	--	--
Dissolved Metals (mg/L)					
Aluminum	0.0924	0.0901	0.169	0.303	0.184
Antimony	--	--	--	--	--
Arsenic	0.00116	0.00044 J	0.00051 J	0.000618 J	0.000725 J
Barium	0.0019	0.00519	0.00599	0.00428	0.00232
Cadmium	--	--	--	--	--
Calcium	12.9	11.9	11.7	4.76	4.97
Chromium	0.000766 J	0.00101	0.00103	0.00032 J	0.000374 J
Cobalt	0.000682	0.000383 J	0.000438 J	0.000197 J	0.000461 J
Copper	0.00279	0.00473	0.00604	0.00637	0.00378
Iron	0.207	0.488	0.654	0.147	0.0839 J
Lead	--	--	--	--	--
Magnesium	1.35	1.89	1.84	1.16	1.27
Manganese	0.0184	0.0138	0.0141	0.0133	0.0179
Nickel	0.00146	--	--	0.00141	0.00122
Potassium	1.85 J	4.15	4.11	2.01	2.56
Selenium	--	--	--	--	--
Sodium	10.4 J	51.7 J	51.7 J	9.2 J	18.9 J
Strontium	0.0319	0.0444	0.0441	0.0242	0.0276
Thallium	--	--	--	--	--
Uranium	--	--	--	0.000128	--
Vanadium	0.00478	0.00948	0.0114	0.0154	0.0158
Zinc	0.00804	--	--	--	--

Table 2-12
Detections of Total and Dissolved Metals in Groundwater Samples

Analyte	West of Former Lab (Cont.)	Background		Main Building	
	MC-005 9/14/01	MW-001 9/14/01	MW-001 4/11/2001	MW-002 9/15/01	MW-002 4/10/2003
Total Metals (mg/L)					
Aluminum	0.535	0.0351	0.0189 J	0.0133	0.0402 J
Antimony	--	--	--	--	--
Arsenic	--	--	0.000293 J	--	--
Barium	0.00442	0.00295	--	0.00282	--
Beryllium	0.000045 J	--	--	--	--
Cadmium	--	--	--	--	--
Calcium	6.7	12.5 J	6.11	9.71	2.8
Cobalt	0.000783	0.000047 J	--	0.00007 J	--
Copper	0.00796	0.00204	0.0176	0.00145	--
Iron	0.483	--	--	--	--
Lead	0.000115 J	0.000209 J	--	--	--
Magnesium	1.6	1.44	0.731 J	1.8	0.41 J
Manganese	0.0236	--	--	--	--
Nickel	0.00186	0.000465 J	--	0.000538 J	--
Potassium	2.32	2.33 J	2.57	2.53	1.30 J
Selenium	--	--	0.000346 J	--	--
Silver	--	--	--	--	--
Sodium	9.41	11.8	14	6.45	--
Strontium	0.0401	0.0441	0.0398 J	0.0331	0.0122 J
Uranium	--	--	--	--	--
Vanadium	0.0115	0.00392	0.00694 J	0.00368	--
Zinc	--	--	--	--	--
Dissolved Metals (mg/L)					
Aluminum	0.153	0.0132	--	0.00542	0.0179 J
Antimony	--	--	--	--	--
Arsenic	0.000578 J	0.000227 J	0.000186 J	0.000294 J	--
Barium	0.00225	0.00264	0.00112 J	0.00297	0.000908 J
Cadmium	--	--	--	--	--
Calcium	6.8	12.5	6.34	10.1	2.98
Chromium	0.000472 J	0.000806 J	--	0.000896 J	--
Cobalt	0.000646	--	--	0.000074 J	0.000771 J
Copper	0.00298	--	--	--	--
Iron	0.16	--	0.00186 J	--	0.00689 J
Lead	--	--	--	--	--
Magnesium	1.6	1.39	0.757 J	1.89	0.425 J
Manganese	0.0218	0.000121 J	--	0.000282 J	0.00382 J
Nickel	0.00135	--	--	--	0.000369 J
Potassium	2.5	2.31	2.35	2.44	1.23
Selenium	--	0.000608 J	--	--	--
Sodium	9.3 J	11.6 J	14.2	6.88 J	1.64 J
Strontium	0.0349	0.0391	0.035 J	0.0325	0.0155 J
Thallium	--	--	--	--	--
Uranium	--	--	--	--	--
Vanadium	0.0123	0.00691	0.00632 J	0.00654	0.00229 J
Zinc	0.0058	--	--	--	--

Table 2-12
Detections of Total and Dissolved Metals in Groundwater Samples

Analyte	Main Building (Continued)				Landfill
	MW-003 2/13/02	MW-303 2/13/02 Duplicate	MW-003 4/10/2003	MW-303 4/10/2003 Duplicate	MW-004 2/13/02
Total Metals (mg/L)					
Aluminum	0.197 J	0.184 J	0.118	0.111	0.125 J
Antimony	0.000525 J	0.000685 J	--	--	0.000909 J
Arsenic	--	--	--	--	--
Barium	0.0047 J	0.00968	--	--	0.0182
Beryllium	--	--	--	--	--
Cadmium	--	--	0.000045 J	0.000059 J	--
Calcium	10	9.97	8.71	8.28	22.9
Cobalt	--	--	--	--	0.0123
Copper	0.00649 J	0.00659 J	--	--	--
Iron	0.41	0.384	--	--	3.98
Lead	0.000131 J	0.000168 J	0.000686	0.000734	0.000111 J
Magnesium	1.19	1.22	1.16	1.12	4.11
Manganese	0.00361 J	0.00729	0.00332 J	0.00347 J	0.0485
Nickel	--	--	--	--	0.0107
Potassium	1.54	1.43	1.15 J	1.16 J	4.37
Selenium	--	--	--	--	--
Silver	--	--	--	--	--
Sodium	4.01	4.09	--	--	10.8
Strontium	0.0911	0.0811	0.0734	0.0689	0.101
Uranium	--	--	--	--	--
Vanadium	0.00666	0.00614	--	--	--
Zinc	0.0321	0.0214	0.0806	0.0756	--
Dissolved Metals (mg/L)					
Aluminum	0.0172 J	0.0201 J	0.0292 J	0.0308 J	0.0144 J
Antimony	0.00015 J	0.000197 J	--	0.0000422 J	0.000092 J
Arsenic	--	--	--	--	--
Barium	0.00254 J	0.00263 J	0.00346 J	0.00322 J	0.011
Cadmium	--	--	0.000045 J	0.00052 J	--
Calcium	10	10.1	8.68	8.39	22.5
Chromium	--	--	--	--	--
Cobalt	--	--	--	--	0.0124
Copper	0.00419 J	0.00402 J	0.00368 J	0.00245 J	--
Iron	--	--	0.00639 J	0.00668 J	3.71
Lead	0.000117 J	--	0.0004	0.000392 J	--
Magnesium	1.16 J	1.15	1.17	1.13	4.02
Manganese	--	--	--	--	0.0469
Nickel	--	--	0.000967 J	0.00083 J	0.0102
Potassium	1.45	1.6	1.0	0.961	4.5
Selenium	--	--	--	--	--
Sodium	4.1	4.22	1.91 J	1.83 J	11
Strontium	0.0672	0.0782	0.0711	0.0703	0.111
Thallium	--	--	--	0.000032 J	--
Uranium	--	--	--	--	--
Vanadium	--	--	0.000952 J	0.00138 J	--
Zinc	0.0178	0.0182	0.0766	0.0766	--

Table 2-12
Detections of Total and Dissolved Metals in Groundwater Samples

Analyte	Landfill (Continued)				
	MW-004 4/11/2003	MW-005 9/15/01	MW-005 4/10/2003	MW-006 9/15/01	MW-006 4/11/2003
Total Metals (mg/L)					
Aluminum	0.051 J	0.0365	0.0851 J	0.375	0.479
Antimony	--	--	--	--	--
Arsenic	0.000158 J	--	0.000136 J	--	0.00186
Barium	--	0.00374	--	0.00895	--
Beryllium	--	--	--	0.000049 J	--
Cadmium	--	--	0.000064 J	--	0.000092 J
Calcium	22.8	3.78	2.91	17.2	85.1
Cobalt	0.0015 J	0.00448	0.000861 J	0.000427 J	0.000978 J
Copper	--	0.00219	--	0.0064	--
Iron	2.61	0.777	--	0.474	--
Lead	--	0.000335 J	--	0.00312	0.000548
Magnesium	4.91	1.31	0.574 J	2.1	3.21
Manganese	0.0194	0.0257	0.019	0.0141	0.031
Nickel	--	0.0052	--	0.00131	--
Potassium	4.64	3.12	1.19 J	2.7	1.74 J
Selenium	--	--	--	--	--
Silver	--	--	--	--	--
Sodium	7.35	6.38	3.76	6.16	4.29
Strontium	0.0972	0.0302	0.0182 J	0.0869	0.254
Uranium	--	--	--	--	--
Vanadium	--	0.00487	--	0.0124	0.00622 J
Zinc	--	--	--	--	--
Dissolved Metals (mg/L)					
Aluminum	--	0.0133	0.0414 J	0.181	0.0114 J
Antimony	--	--	--	--	0.00195 J
Arsenic	0.000611 J	0.000188 J	0.000141 J	0.000403 J	0.000313 J
Barium	0.0075	0.00365	0.0071 J	0.00782	0.00661
Cadmium	--	--	--	--	0.000042 J
Calcium	23.1	3.79	2.91	18	84.6
Chromium	--	0.000594 J	--	0.000935 J	--
Cobalt	0.00143 J	0.00421	--	0.000289 J	--
Copper	--	--	--	0.00442	--
Iron	2.53 J	0.378	0.108	0.108	0.0206 J
Lead	--	--	--	--	--
Magnesium	4.91	1.28	0.57 J	2.22	3.2
Manganese	0.0179	0.0277	0.0182	0.0096	0.0158
Nickel	0.00154 J	0.00444	0.000551 J	--	--
Potassium	4.57	3.24	1.05	2.81	1.57
Selenium	--	--	--	--	--
Sodium	6.52	6.46 J	3.38	5.67 J	3.53
Strontium	0.0958	0.0288	0.0207 J	0.0841	0.248
Thallium	--	--	--	--	--
Uranium	--	--	--	--	--
Vanadium	0.000845 J	0.00577	0.00194 J	0.0133	0.00351 J
Zinc	--	--	0.00293 J	--	0.00144 J

Table 2-12
Detections of Total and Dissolved Metals in Groundwater Samples

Notes:
-- - analyte was not detected
J - value estimated
mg/L - milligram per liter

Table 2-13
Groundwater Level Measurements and Elevations

Well No.	Top of Casing Elevation (feet msl)	September 15, 2001		April 9, 2003	
		Groundwater Level Measurement (feet btoc)	Groundwater Elevation (feet msl)	Groundwater Level Measurement (feet btoc)	Groundwater Elevation (feet msl)
Monitoring Wells					
MW-1	42.021	15.49	26.53	10.99	31.03
MW-2	40.067	13.63	26.44	8.65	31.42
MW-3	36.894	10.72	26.17	5.15	31.74
MW-4	38.178	12.62	25.56	6.75	31.43
MW-5	35.493	12.48	23.01	3.52	31.97
MW-6	35.286	12.47	22.82	3.64	31.65
Microwells					
MC-1	NA	10.21	NA	--	--
MC-2	37.26	10.88	26.38	--	--
MC-3	38.77	12.38	26.39	--	--
MC-4	38.26	11.87	26.39	--	--
MC-5	38.06	11.66	26.40	--	--

Notes:
btoc - below top of casing
msl - mean sea level
NA - survey data not available for this temporary microwell
-- - not measured

Table 2-14
Detected Analytes Exceeding Project Regulatory Screening Values (Concrete, Sediment, and Soil)

Analyte	EPA Region 9 Industrial Soil PRG [a]	Landfill Drum Concrete		Concrete Sump Sediment		Fuel Oil Tank Vault Soil	
		DC-001 9/14/01	DC-301 9/14/01 Duplicate	SD-001 9/14/01	SD-301 9/14/01 Duplicate	SS-021-04 9/7/01	SS-321-04 9/7/01 Duplicate
Metals (mg/kg)							
Arsenic	**2.7 ca**	21.1 J	20.1 J	23.7 J	23.4 J		
Chromium	**64 ca**			101	99.4		
PCBs/Pesticides (mg/kg)							
Aroclor 1242	**1,000 ca**			6,060 D	3,920 D		
SVOCs (mg/kg)							
Benzo(a)pyrene	**290 ca**					1,260	1,960
VOCs (mg/kg)							
1,2-Dibromoethane	**48 ca**						

Table 2-14
Detected Analytes Exceeding Project Regulatory Screening Values (Concrete, Sediment, and Soil)

Analyte	EPA Region 9 Industrial Soil PRG [a]	Landfill North Toe Soil				Landfill Trench TR-1 Soil	Landfill Trench TR-2 Soil		
		SS-022-01 9/14/01	SS-023-01 9/14/01	SS-024-01 9/14/01	SS-025-01 9/14/01	SS-026-05 9/10/01	SS-027-04 9/11/01	SS-327-04 9/11/01 Duplicate	SS-027-13 9/11/01
Metals (mg/kg)									
Arsenic	**2.7 ca**				4.51 J	3.88	3.14	3.0	4.11
Chromium	**64 ca**								
PCBs/Pesticides (mg/kg)									
Aroclor 1242	**1,000 ca**								
SVOCs (mg/kg)									
Benzo(a)pyrene	**290 ca**	482	906	316			438		
VOCs (mg/kg)									
1,2-Dibromoethane	**48 ca**								

Table 2-14
Detected Analytes Exceeding Project Regulatory Screening Values (Concrete, Sediment, and Soil)

Analyte	EPA Region 9 Industrial Soil PRG [a]	Landfill Trench TR-3 Soil SS-028-05 9/11/01	Landfill Trench TR-4 Soil SS-029-05 9/12/01	Landfill Trench TR-5 Soil SS-033-01 9/12/01
Metals (mg/kg)				
Arsenic	**2.7 ca**	8.02	3.57 J	
Chromium	**64 ca**			
PCBs/Pesticides (mg/kg)				
Aroclor 1242	**1,000 ca**			
SVOCs (mg/kg)				
Benzo(a)pyrene	**290 ca**			
VOCs (mg/kg)				
1,2-Dibromoethane	**48 ca**			111 J

[a] EPA Region 9 PRGs (industrial soil), November 2000.

Notes:

ca - carcinogen
D - value is derived from a dilution
EPA - U.S. Environmental Protection Agency
J - value estimated
µg/kg - microgram per kilogram
mg/kg - milligram per kilogram
PCBs - polychlorinated biphenyls
PRG - Preliminary Remediation Goal
SVOCs - semivolatile organic compounds
VOCs - volatile organic compounds

Table 2-15
Detected Analytes Exceeding Project Regulatory Screening Values (Groundwater)

	Screening Values			Drainage Ditch	Dry Well		West of Former Laboratory		
Analyte	**EPA MCL [a]**	**EPA Region 9 Tap Water PRG [b]**	**EPA AWQC [c]**	**MC-001 9/14/01**	**MC-002 9/15/01**	**MC-302 9/15/01 Duplicate**	**MC-003 9/14/01**	**MC-004 9/14/01**	**MC-005 9/14/01**
Total Metals (mg/L)									
Arsenic	**0.01**	**0.000045**	**0.000018**						
Dissolved Metals (mg/L)									
Arsenic	**0.01**	**0.000045**	**0.000018**	0.00116	0.00044 J	0.00051 J	0.000618 J	0.000725 J	0.000578 J
VOCs (mg/L)									
Carbon Tetrachloride	**5**	**0.17**	**0.25**	0.281 J					

Table 2-15
Detected Analytes Exceeding Project Regulatory Screening Values (Groundwater)

Analyte	Screening Values			Main Building			Landfill				
	EPA MCL [a]	EPA Region 9 Tap Water PRG [b]	EPA AWQC [c]	MW-001 9/14/2001	MW-001 4/11/2003	MW-002 9/15/01	MW-004 4/11/2003	MW-005 9/15/01	MW-005 4/10/2003	MW-006 9/15/01	MW-006 4/11/2003
Total Metals (mg/L)											
Arsenic	**0.01**	**0.000045**	**0.000018**		0.000293 J		0.000158 J		0.000136 J		
Dissolved Metals (mg/L)											
Arsenic	**0.01**	**0.000045**	**0.000018**	0.000227 J	0.000186 J	0.000294 J	0.000611 J	0.000188 J	0.000141 J	0.000403 J	0.000313 J
VOCs (mg/L)											
Carbon Tetrachloride	**5**	**0.17**	**0.25**								

[a] EPA National Primary Drinking Water Regulations, Current Drinking Water Standards (MCLs), 2001.
[b] EPA Region 9 PRGs (tap water), November 2000.
[c] EPA National Recommended Water Quality Criteria - Correction, April 1999 (Water + Organism)

Notes:
AWQC - ambient water quality criteria
EPA - U.S. Environmental Protection Agency
MCL - maximum contaminant level
mg/L - milligram per liter
µg/L - microgram per liter
PRG - Preliminary Remediation Goal
VOCs - volatile organic compounds

Table 2-16
Analytical Detections in Product Samples

Analyte	PD-001 1/8/02	PD-002 1/8/02	PD-302 1/8/02 Duplicate
VOCs (mg/kg)			
Ethylbenzene	478,000	188,000	135,000
Isopropylbenzene	393,000	--	--
m,p-Xylene	1,860,000	692,000	436,000
o-Xylene	1,030,000	244,000	181,000
Toluene	391,000	--	--
SVOCs (mg/kg)			
2-Methylnaphthalene	383,000 JD	989	8,170 J
Acenaphthene	6,780 J	--	--
Acenaphthylene	1,300 J	--	--
Biphenyl	25,600 J	--	--
Fluoranthene	1,770 J	--	--
Fluorene	8,270 J	--	--
Naphthalene	960,000 JD	24,500	83,300 J
Phenanthrene	25,900 J	--	--
Pesticides (mg/kg)			
4,4'-DDE	0.387	--	--
Endosulfan II	0.189 J	--	--
Metals (mg/kg)			
Aluminum	118	12.2 J	8.39 J
Antimony	0.85 J	0.0723 J	0.273 J
Barium	0.881	1.47	1.95
Beryllium	0.0747 J	--	--
Cadmium	0.199 J	--	--
Calcium	114 J	3,390	3,530
Chromium	1.68	0.725 J	1.08 J
Cobalt	62.9	2.8	2.88
Copper	624	0.665 J	1.24 J
Iron	52.2	91.3	85
Lead	95,000	10.1	116
Magnesium	7.25 J	140 J	141 J
Manganese	36.3	20	22.1
Nickel	0.266 J	0.217 J	0.157 J
Potassium	--	10,300	9,510
Silver	13.2	0.133 J	0.129 J
Sodium	--	4,970	4,690
Strontium	1	2.98	3.17
Thallium	0.303 J	--	--
Vanadium	0.482 J	--	0.309 J
Zinc	5.35 J	2.88 J	1.79 J
Conventionals			
Cyanide (mg/kg)	--	--	0.41 J
pH (pH units)	5.19	6.05	6.11
Flashpoint (deg F)	115	104	106

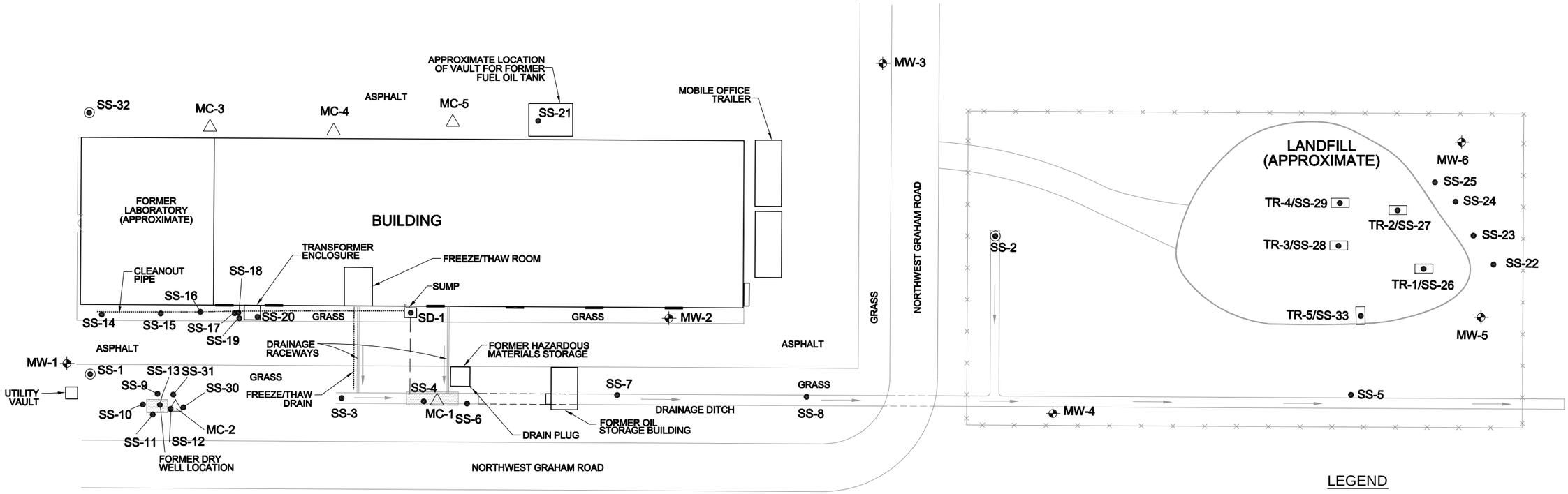
Notes:

-- - analyte was not detected
D - value is derived from a dilution
J - value is estimated
µg/kg - microgram per kilogram
mg/kg - milligram per kilogram
SVOCs - semivolatile organic compounds
VOCs - volatile organic compounds

Table 2-17
Soil Sample Survey Information

Sampling Location	Northing (NAD 83)	Easting (NAD 83)	Ground Surface Elevation (feet msl) (NAVD 1988)
SS-1	692658.5	7718259	39.02
SS-3	692848.2	7718280	34.65
SS-2	693344.4	7718166	34.46
SS-4	692910.3	7718284	34.46
SS-5	693611.1	7718292	34.45
SS-6	692943.0	7718286	34.36
SS-7	693056.4	7718281	33.64
SS-8	693199.6	7718285	33.24
SS-9	692709.2	7718274	37.38
SS-10	692698.0	7718282	37.06
SS-11	692705.3	7718290	37.51
SS-12	692718.8	7718286	36.73
SS-13	692710.8	7718283	36.83
SS-14	692668.1	7718214	39.13
SS-15	692712.7	7718214	38.86
SS-16	692742.7	7718213	38.38
SS-17	692768.5	7718214	38.34
SS-18	692771.3	7718214	38.18
SS-19	692772.0	7718218	38.39
SS-20	692785.7	7718218	38.01
SS-21	693000.4	7718073	37.78
SS-22	693720.5	7718194	35.29
SS-23	693705.7	7718172	35.67
SS-24	693692.6	7718146	36.03
SS-25	693677.3	7718131	35.47
SS-26	693667.6	7718197	40.27
SS-27	693648.7	7718152	42.90
SS-28	693603.6	7718178	41.87
SS-29	693605.1	7718146	41.93
SS-30	692728.6	7718285	36.84
SS-31	692721.0	7718275	36.82
SS-32	692661.3	7718061	38.93
SS-33	693619.5	7718231	38.33

Notes:
msl - mean sea level
NAD - North American Datum of 1983
NAVD - North American Vertical Datum of 1988



LEGEND

- GROUNDWATER MONITORING WELL
- SOIL OR SEDIMENT SAMPLE
- TEMPORARY GROUNDWATER MICROWELL
- BACKGROUND SAMPLE
- EXPLORATORY TRENCH
- FORMER SOIL REMOVAL AREA

N

0 40 80 160

SCALE FEET

FILENAME: Q:\Geo\COE\Troutdale\SITE INVEST\FIG 2-1.dwg
EDIT DATE: 05/14/03 AT: 14:32

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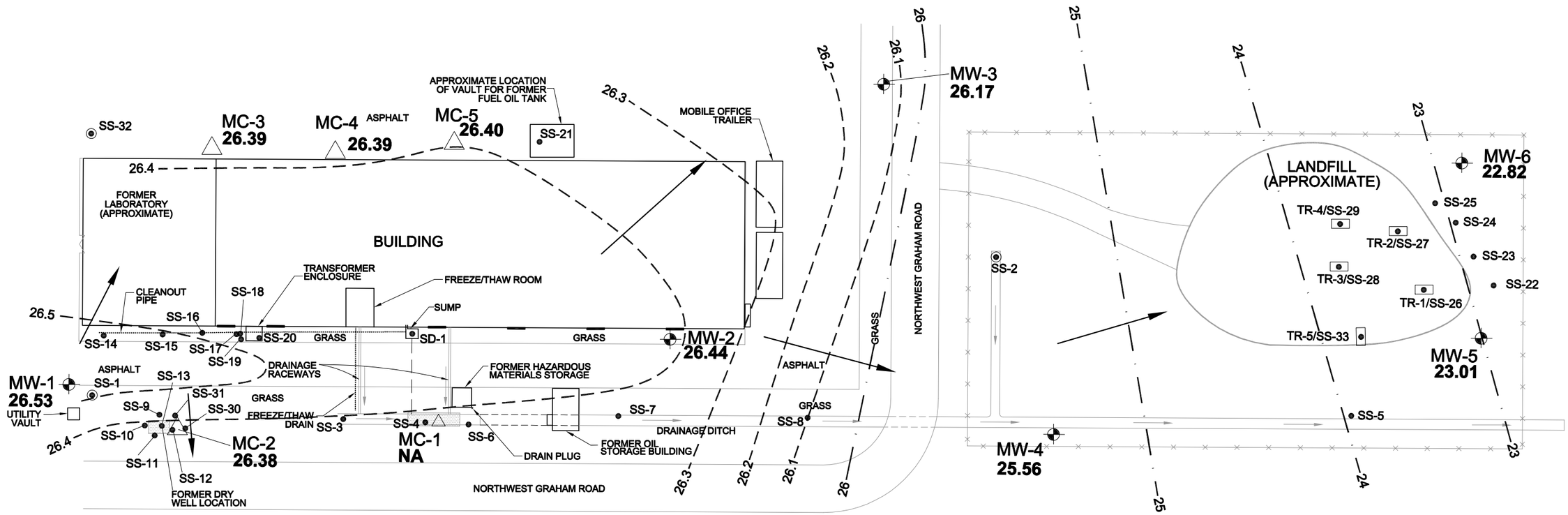
SITE INVESTIGATION

Sampling Locations

TROUTDALE, OREGON

FIGURE 2-1



LEGEND

- GROUNDWATER MONITORING WELL
- SOIL OR SEDIMENT SAMPLE
- GROUNDWATER MICROWELL
- BACKGROUND SAMPLE
- EXPLORATORY TRENCH
- FORMER SOIL REMOVAL AREA
- 26 — INFERRED GROUNDWATER ELEVATION CONTOUR (1.0 FOOT)
- 26.1 — INFERRED GROUNDWATER ELEVATION CONTOUR (0.1 FOOT)
- **23.01** GROUNDWATER ELEVATION (FEET MSL) 9/15/01
- NA NOT AVAILABLE
- INFERRED GROUNDWATER FLOW DIRECTION

N

0 40 80 160

SCALE FEET

FILENAME: O:\Geo\COE\Troutdale\SITE INVEST\FIG 2-2.dwg
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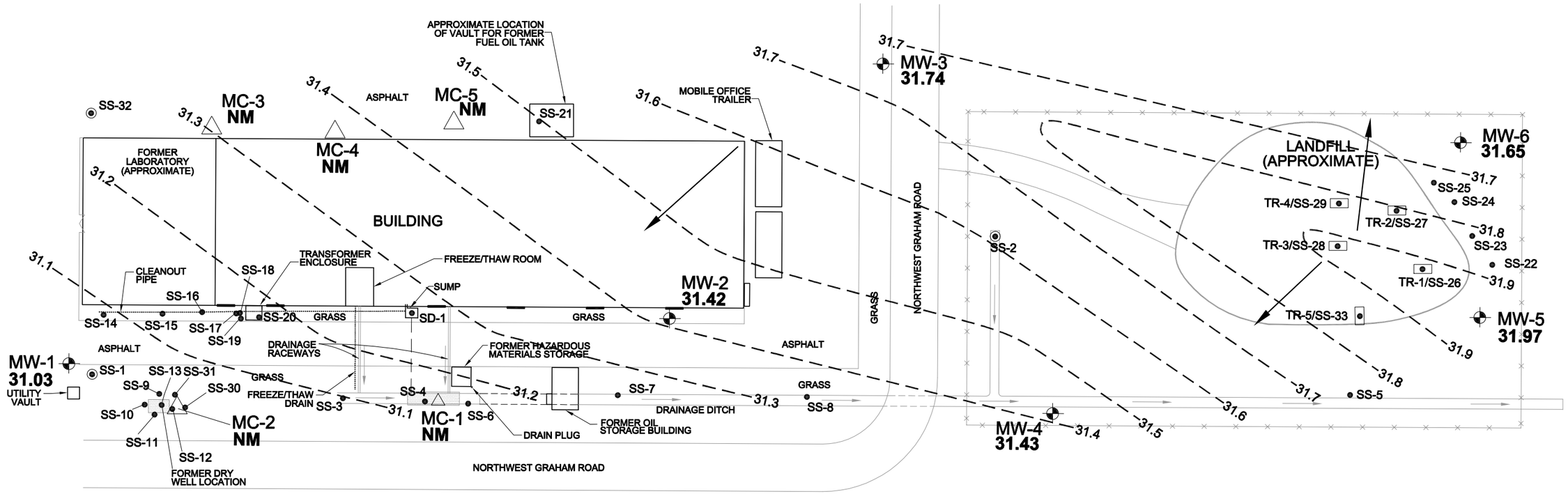
Groundwater Elevations and Contours (September 2001)

TROUTDALE, OREGON

FIGURE 2-2



LEGEND

- GROUNDWATER MONITORING WELL
- SOIL OR SEDIMENT SAMPLE
- TEMPORARY GROUNDWATER MICROWELL
- BACKGROUND SAMPLE
- EXPLORATORY TRENCH
- FORMER SOIL REMOVAL AREA
- 31.4 — INFERRED GROUNDWATER ELEVATION CONTOUR (0.1 FOOT)
- **31.43** GROUNDWATER ELEVATION (FEET MSL) 4/9/03
- NM NOT MEASURED
- INFERRED GROUNDWATER FLOW DIRECTION

N

0 40 80 160

SCALE FEET

FILENAME: Q:\Geo\COE\Troutdale\SITE INVEST\FIG 2-3.dwg
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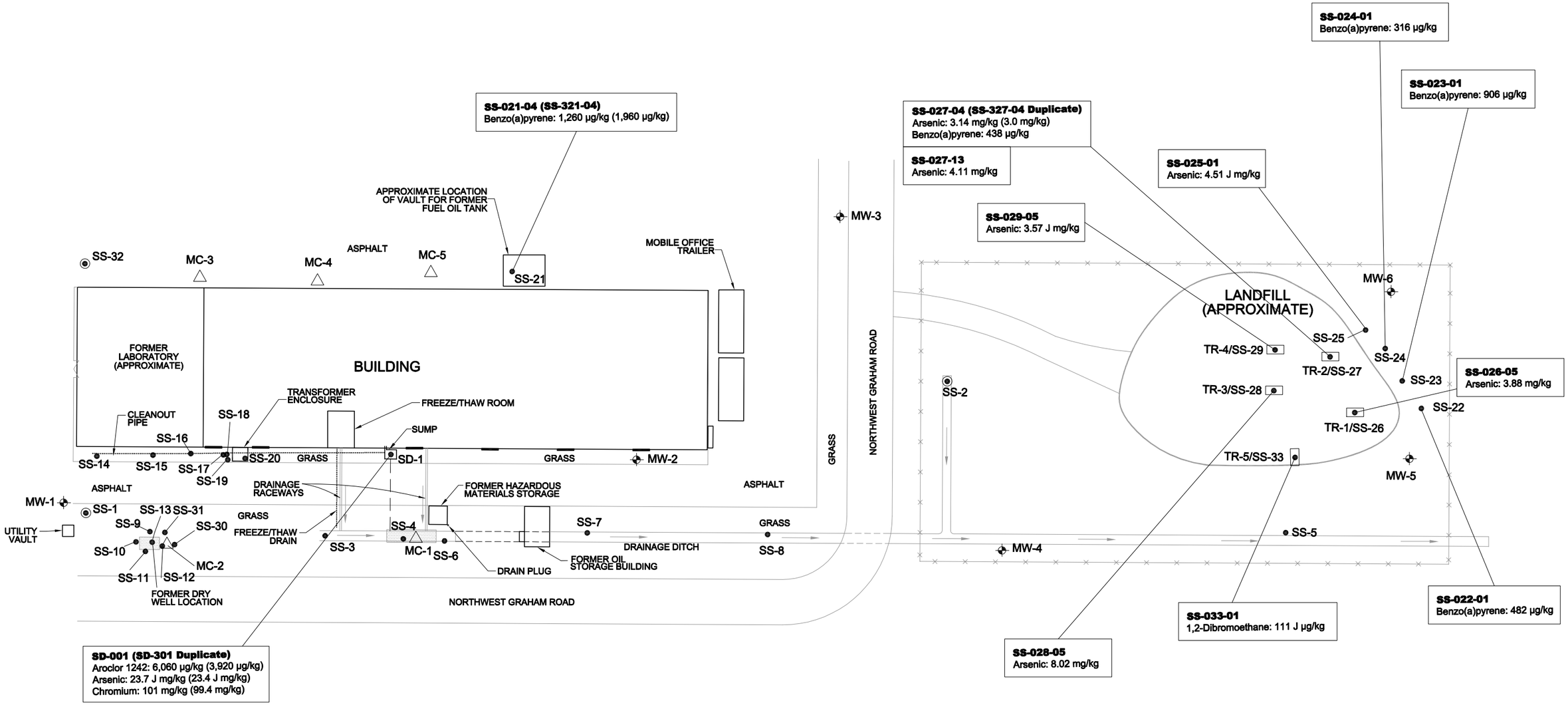
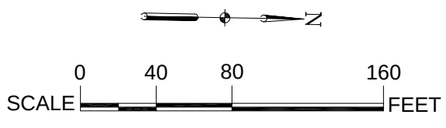
SITE INVESTIGATION

Groundwater Elevations and Contours (April 2003)

TROUTDALE, OREGON

FIGURE 2-3





LEGEND

- GROUNDWATER MONITORING WELL
- SOIL OR SEDIMENT SAMPLE
- TEMPORARY GROUNDWATER MICROWELL
- BACKGROUND SAMPLE
- EXPLORATORY TRENCH
- FORMER SOIL REMOVAL AREA
- µg/kg MICROGRAM PER KILOGRAM
- mg/kg MILLIGRAM PER KILOGRAM
- J CONCENTRATION ESTIMATED

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SITE INVESTIGATION

Locations and Concentrations That Exceed Screening Values (Soil and Sediment)

TROUTDALE, OREGON

FIGURE 2-4

FILENAME: O:\Geo\COE\Troutdale\SITE INVEST\FIG 2-4 EXCEED SOIL.dwg
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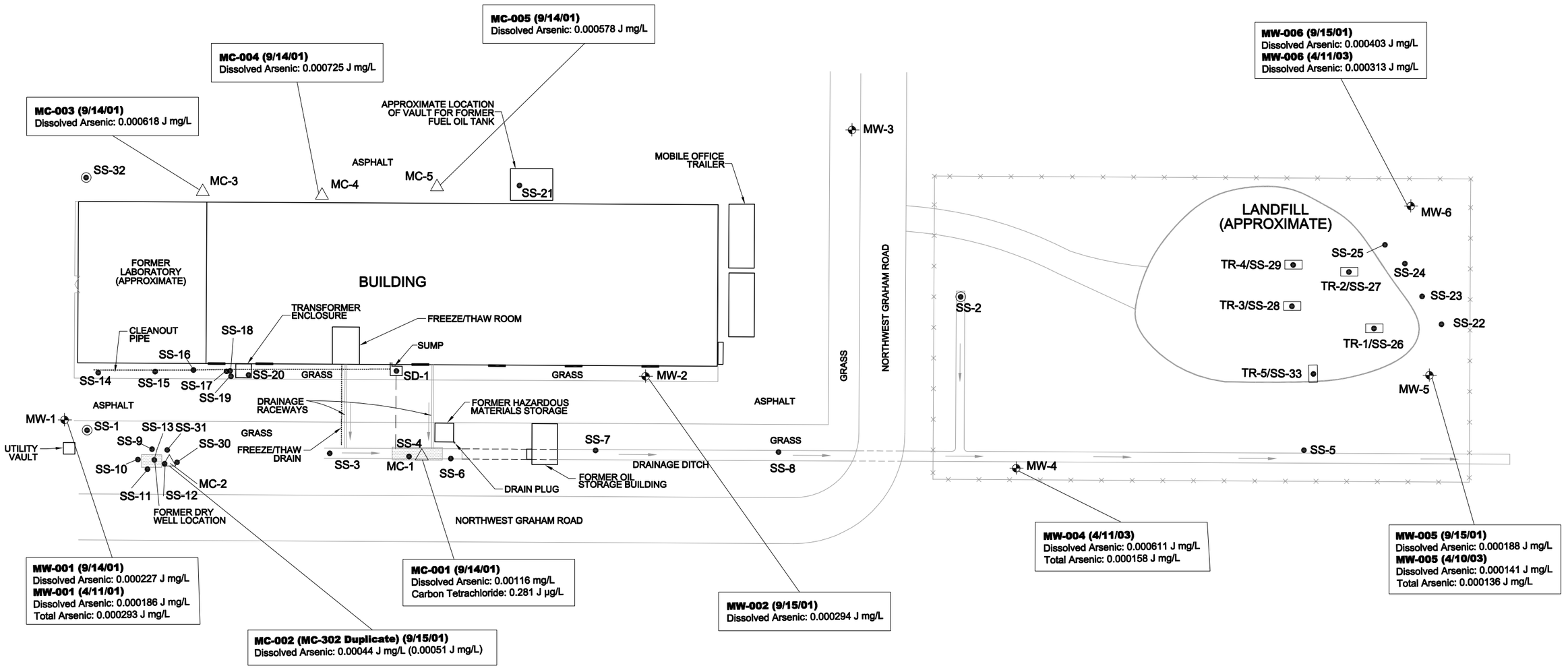

LEGEND

- GROUNDWATER MONITORING WELL
- SOIL OR SEDIMENT SAMPLE
- TEMPORARY GROUNDWATER MICROWELL
- BACKGROUND SAMPLE
- EXPLORATORY TRENCH
- FORMER SOIL REMOVAL AREA
- µg/L MICROGRAM PER LITER
- mg/L MILLIGRAM PER LITER
- J CONCENTRATION ESTIMATED

N

0 40 80 160

SCALE FEET

FILENAME: Q:\Geo\COE\Troutdale\SITE INVEST\FIG 2-5 EXCEED GW.dwg
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SITE INVESTIGATION

Locations and Concentrations That Exceed Screening Values (Groundwater)

TROUTDALE, OREGON

FIGURE 2-5